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THE NATURE OF VOCAL SOUNDS*

ROBERT WEST
University of Wisconsin

A Dissertation Based on a Series of Original Experiments

I
INTRODUCTION

Definition—By vocal sounds is meant, first, all speech sounds is in which the laryngeal vibrations predominate[1] over all other vibrations, such as (A) the so-called pure vowels: [i] as in see, [ɑ] as in calm, etc. (B) the nasals: [m], [n], and [ŋ] as in moaning. (C) the semi-vowels: [w] as in will, and [j] as in yes. (D) the so-called liquid consonants [ɹ] and [l] as in roll. It includes second, the element of voice in all of those speech sounds in which the laryngeal vibrations, although not predominant[1], yet lend to the sounds essential characteristics such as [v] as in vim, [ð] as in those, [ʒ] as in pleasure, [b] as in boy, as over against their unvoiced equivalents: [f] as in fin, [θ] as in thin, [ʃ] as in shin, [p] as in pin.

Vocal sounds have occupied the attention of investigators for many centuries. Three groups of students have approached the subject each with their own technic: philologists, phonologists, and

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[1] The word "predominate" is used in this connection because no sound is completely free from mechanical vibrations at frequencies bearing no relation to the fundamental laryngeal frequency. Such sounds as [z] and [s] have a maximum of this frictional vibration, while sounds such as [ɑ:] and [u:] have a minimum. Thus in whispered speech, in which there is no laryngeal vibration, voiced and unvoiced consonant sounds are difficult to distinguish. The phase of speech sounds being considered in this dissertation is therefore that part which would be left after subtracting all of the elements that are indistinguishable one from another in whispered speech. For purposes of the present study we do not regard a whispered vowel as vocal sound.

The symbols used are those of the international phonetic alphabet.

phoneticians. The methods employed have overlapped greatly so that any one who has attacked the problem, before he was adequately prepared to prosecute efficient research, has had to be conversant with these three fields. H. von Helmholtz, whose training embraced not only these three subjects but physiology and general physics as well, began a physico-physiological approach to the subject of voice study. Although the present investigation borrows much from the classical and conventional technic of approach to our problem, yet it is predominantly physiological.

Physiology is the science of the functioning of the organs of the body. Thus the concern of the present investigator has been not only with the end product, namely the speech sounds themselves, but with the function of the organs producing those sounds. Since the study is with vocal sounds, the organ whose function is our chiefest concern is the larynx. The anatomical study of the larynx was begun in a systematic way over a century ago and has now reached a standstill. In short it seems that the gross anatomy of the larynx is thoroughly known. This anatomical information, however, has not thrown much light upon the nature of its function. It has revealed to us merely that the larynx is a vibrator variable in amplitude and frequency. How laryngeal vibrations are made the anatomist can only guess. His usual inference is that the so-called vocal bands are caused to oscillate by the outrushing air current. The physiologist, therefore, must study the larynx in action for a more complete knowledge.

Gutsmann, a distinguished German physiologist, developed the stroboscopic-laryngoscope (strobo-laryngoscope) for the study of the larynx by examination through the throat. This device enabled him to watch from above the movements of the vocal bands so as to determine how they approach each other on phonation and how far they are separated during the course of each vibration. Gutsmann also mounted a cadaver's head on an artificial trachea to which was attached a pair of bellows in such a manner that he could cause the larynx to produce vocal sound and could alter that sound in pitch and volume by manipulation of the muscles of the mounted specimen. Moreover many investigators have made tracings from the speech sounds delivered at the mouth. Aside from these attempts very little has been done by way of physiological investigation of the larynx.

II

THE MAGNETOPHONOSCOPE

The first step in the present investigation was to devise apparatus to record movements of the larynx without relying upon the air currents delivered at the mouth or nose. These currents are so greatly modified by the resonance and friction of the organs of articulation that one cannot judge from them the nature of the original fundamental vibrations. For this direct study of the larynx the magnetophonoscope was developed. This instrument is an adaptation of the magnetophonograph. The form of the magnetophonograph employed was the telegraphone manufactured by the American Telegraphone Company of Springfield, Mass. (see plate one, figs. 1 and 2). The magnetophonograph (see plate two, fig. 3) consists of two circuits, the primary and secondary. In the primary circuit is the microphone, much like the microphone employed in the Bell telephone, and the primary coil of the transformer. This circuit is supplied by a battery at a pressure of six volts. In the secondary circuit are the secondary coil of the transformer and an electro-magnet. Drawn through the field of this electro-magnet is a fine steel wire about three miles in length. The wire is wound on two spools. When the apparatus is in operation the wire is wound from one spool to the other, every portion of it passing through the field of the electro-magnet in the secondary circuit.

No current flows through a secondary coil of an inductorium except and only when there is a change in the voltage in the primary coil. Thus when no sound is produced before the microphone the steel record wire is drawn through a stable magnetic field, but when a sound disturbs the diaphragm of the microphone, the voltage of the primary coil is suddenly changed. This produces a current through the secondary circuit and changes the strength of the electromagnet, thus changing the strength of the magnetism imparted to the steel wire drawn through its field.

The magnetophonograph records speech in the magnetic arrangement of the molecules of this steel wire. This wire is removed from the machine and so mounted that it passes directly over the midpoint of the pivot of a sensitive compass needle. (See plate three, figure 4). Thus, as the wire is turned from point to point, the compass needle records the sign and degree of the magnetic field at each point, and this magnetic field is a reproduction of the sign and degree of the electro-magnetic field in the magnetophono-

graph at the instant that the given section of the wire was being recorded upon. That electro-magnetic field, in turn, varies in sign and degree in accord with the movements of the diaphragm of the acousticon into which the speaker was talking. Inasmuch as there is only one mechanical process (the movement of the diaphragm of the acousticon) between the speaking and the analysis by the compass needle, there is little opportunity for mechanical distortion, and as no amplifying bulbs are used, the electrical distortion is reduced to a minimum. It is safe to say, then, that the magnetic arrangement of the molecules in the steel wire is a fairly accurate picture of the sound waves that are being studied.

The next problem then is simply that of representing graphically the magnetic arrangement of each succeeding point on the wire. The wire is mounted on two bronze spools. A fine check mark is made at the base of one spool and a polar scale is laid underneath the spool. A similar polar scale is laid underneath the compass needle. The spool is turned one degree at a time, and a reading of the position of the needle is taken for each successive degree. (Note: It is of course obvious that the wire should be so mounted that the magnetic north line is at right angles to it; thus any magnetism will cause a deflection, and movements to the right will indicate magnetism of sign opposite to those to the left). Figure 5 represents a curve made as here described. This is a graph of a single vibration. The vibrations coming before and after this one looked very similar to it. It shows what took place in the microphone during 1/123 of a second.[2] Interpreting the curve we see that there is a sharp rise in pressure for the first few thousandths of a second, then a decrease in pressure, and a second increase to the maximum pressure, after which there is a rather gradual falling away until the point at which a second vibration is initiated.

Figure 5 represents schematically the arrangement of spools and the scales employed.

It is obvious that this method, although an accurate one, is exacting and laborious. A much quicker method and one best suited for qualitative study of speech units makes use of photographic methods of recording. (See plate four). In this method, instead of turning the spool section by section, the wire is pulled

[2] See page 250 for the method of timing.

through the field of the magnet continuously but very slowly. The speed of the process is reduced to the point at which the inertia of the magnetic needle has been eliminated. The spool is turned not by hand, but by a slow clock work mechanism. The compass needle, instead of being mounted upon a polar scale, is mounted on a thin piece of board pierced by a parabolic slit[3] whose focus is the pivot of the compass needle and whose axis is in the line of the true magnetic north pole. Underneath this slit a strip of sensitized photographic paper is drawn by means of a kymograph. This paper is drawn from south to north. A beam of light is directed from an artificial source upon the needle so that the strip of paper as it is drawn underneath the needle is photographed except at the places where it is within the shadow of the compass needle. The device is operated in the dark room. Thus when the wire is drawn slowly and the kymograph turned slowly the needle is made to record photographically its position from time to time.

The device described thus far is adequate for the recording of vibrations produced through changes in air pressure. In order to study the larynx itself a modification of the microphone was necessary. To meet this requirement a stethoscope was substituted for

[3] The practical accuracy of this method of graphing voice curves depends upon the ratio between the distance along the wire from one critical point to the next and the length of the compass needle. If the needle, from pivot to point, is shorter than the distance along the wire between points of different magnetic potential, it is relatively responsive to *each* of such points. If its length is greater it tends to respond to *both* of them as to one point. Thus the wave is "smoothed out." In spite of the great speed of the magnetophonograph employed (about 3.75 meters of wire per second) an entire wave-length at a woman's high pitch, say 500 per second, would be about .75 centimeters. Middle C would spread out along the wire to about 1.50 centimeters. A relative low pitch in a man's voice would have a wave-length of 3.00 centimeters. The needle used had a total length of .80 centimeters and an effective length of .40 centimeters from pivot to point. To make for effective photography this length was increased by glueing strips of bamboo fibre to the arms of the needle, thus making each arm about one centimeter.

The shape of the slit through which the position of the compass needle is photographed gave the investigator much concern. A straight slit has a tendency to distort the wave by increasing the apparent amplitude of the movement of the needle at its extremes of excursion. The semicircular slit, on the other hand minimizes this movement. The parabola tends to correct these distortions.

the receiver of the microphone. The type of stethescope employed was that usually used for sphygmomanometry, having a diaphragm on the center of which is located a button, which is pressed upon the surface to be studied. This instrument was adapted by removal of the aural tubes so that it could be inserted into the opening of the microphone in place of the mouthpiece. (See figure 2).

The point of the thyroid cartilage (i. e., of the Adam's apple) was selected as the point upon which to apply the stethoscope, for at that point we are nearest to the anterior attachment of vocal bands.

That such an apparatus is responsive to no vibrations except those communicated to it by actual mechanical contact on the diaphragm of the stethoscope, is evident to one who will apply to his ears an unmodified instrument of this type and hold it near but not in contact with the larynx of a subject experimented upon. When the subject phonates, the experimenter hears the sound distinctly, but the volume of the sound is in no way diminished by pinching the rubber, aural tubes, showing that the sound that he hears enters around the ear pieces from the open air spaces rather than through the ear pieces from the chamber of the stethoscope proper. Let the button of the instrument be laid upon the larynx, however, and the tone is at once amplified. The diaphragm of the stethoscope, then, is insensitive to ordinary vocal air vibrations at the distance from the mouth required for an investigation of the larynx. The stethoscope receiver or "chest piece" is so mounted upon the microphone as to exclude from its sensitive diaphragm all vibrations except those from the stethoscope. A piece of rubber tubing renders the joint air tight, but the tubing itself is prevented from vibration by a layer of metal on either side. This assembly was tested by making a record on the magnetophonograph with the stethoscope held near but not on the larynx. No perceptible sound was returned through the receivers of the magnetophonograph. We may say, then, that this adaptation provides a means of making audible and of recording the inaudible vibrations of the surface of the throat.

We now had a way of recording movements of the surface of the larynx either by the graphic method or by the photographic method. Still the apparatus was not suited for accurate quantitative work inasmuch as no time record was at hand. It was found

that the talking head (See fig. 1) makes one complete excursion while the driving spool at the right is revolving 150 times. Thus it is possible by timing one excursion of the talking head and dividing that time by 150 to determine the time required for one revolution of the driving spool. The more consecutive excursions of the talking head that one times, the more accurately is the final quotient a measure of the time of one revolution. In actual use a stop watch reading to fifths of seconds was employed and six to ten consecutive excursions were timed. The record to be studied was taken upon the fourth or fifth excursion of the talking head, so that, if there were any variations in the speed of the motor driving the spools of wire, this record would be made at average speed. As a matter of fact, we have no reason to believe that the motor moved unsteadily. The source of current was steady and the motor was always set in revolution so that it could attain its maximum even speed before the stop watch was started.

An error of one-fifth of a second in recording six excursions of the talking head would be divided by 900 in the estimated time that was required for one revolution of the driving spool. It was found by timing with two watches in the hands of two experimenters that the error was never more than a fifth of a second. Thus the timing of a single revolution of the driving spool was accurate to 1/4500 of a second. When this record was reproduced photographically, a polar coördinate scale was laid on top of the driving spool. (See figure 6). A fixed pointer at the side of the scale indicated how far it had turned. The light shining upon the compass needle was controlled by a pull switch so that the light could be momentarily interrupted at any desired point in the record. In actual practice the switch was pulled whenever the pointer indicated that the spool had turned a quarter of a revolution. This checked the record in time lines, the distance between them representing an interval of time equal to one eighth, one fourth, or one half (as seemed expedient) of the time of the original revolution of the driving spool, i. e., the exact speed of revolution when the record under study was made. (See figures 11, 12, 13, et seq.)

When the curves of the experimenter's own laryngeal movements were first produced it was at once evident that for every wave of what was perceived as the fundamental, there were two

laryngeal movements, i. e., if the voice were made to sound in unison with a fork of a frequency of 128 v. per second, the curve would show two "humps," or maxima, for every interval of 1/128 of a second. (See figures 5, 12, 13, 15, 18). An attempt to view the larynx internally with a strobo-laryngoscope failed to reveal the reason for this double movement.[4] There are three reasons for this failure: (a) the technical difficulty of timing the stroboscope and the voice in unison and of holding the two at the same frequency long enough to make observations; (b) the technical difficulty of making observations that include enough of the walls of the larynx to give one an adequate notion of what effect the changes of air pressure and muscle tension have upon them; (c) the difficulty of determining what the ratio is between the stroboscopic exposures and the movements under observation. Under the conditions of strobo-laryngoscopy at its best the difference in appearance between a structure vibrating at a ratio of 1 with respect to the stroboscope, and another vibrating at a ratio of ½ is difficult to recognize. Hence no reasonable deductions as to the frequency of movements under observation could be drawn.

III
THE ARTIFICIAL LARYNX

It was because of the difficulty of making a satisfactory visual observation of the larynx in action, that it seemed expedient to

[4] The stroboscope (see plate five, figs. 7 and 8) is an instrument for studying the successive phases of a periodic or varying motion by means of light periodically interrupted (stroboscope=στρόβος, a whirling+σκωπός, observer.) This interruption of light is accomplished by a disk with alternate open and closed sectors, which when revolving gives successive instantaneous views of a moving object. If the object moves in recurrent periods or phases and the exposures by the stroboscope are timed to the frequency of the oscillations or revolutions to be studied, only one phase will appear to the observer and the object will appear to be at rest. If the speed of the stroboscope is slightly different from that of the object, each successive exposure will catch a slightly different phase of the oscillation or revolution and the objects studied will appear to move slowly; if the speed of the stroboscope is such that the period between successive exposures is shorter than the period of the movement of the object studied, it will appear to move backward; if the opposite is true of their relative speeds it will appear to move forward. In its adaptation to the laryngoscope the disk intervenes between the source of light and the head mirror, so that the observer sees the throat only when an open sector of the disk allows the light to illuminate the field of vision.

construct an artificial larynx. (See plate six, fig. 9). A piece of pasteboard tubing about four centimeters in diameter was capped at one end by a taut tympan of thin rubber, slit once across its entire diameter so as to produce two edges capable of vibration. The other end of the tube was attached to a short piece of flexible rubber tubing, so that the experimenter could send a blast of air through the device and watch its effect upon the edges of the slit in the rubber tympan. This device was tested as to its functional similarity to the human larynx by taking magnetophonoscopic tracings. The stethoscopic button was pressed against the side of the pasteboard tubing near the end of the slit in the rubber cap. The tracings were found to be interestingly similar, each curve showing the characteristic double-maximum. Later the button of the stethoscope was held at various points on the surface of the artificial larynx, with no change in the characteristics of the curve produced, showing that the movements were due to the changes of internal air pressure rather than to distortion produced by the stretching of the "vocal bands," for had the latter cause been operative in the movements recorded they would have varied from point to point along the surface of the pasteboard tubing. (See plates seven to thirteen).

Visual examination of the vibrating "vocal bands" of the artificial larynx showed at first inspection a fuzziness or indistinctness across the entire slit, more pronounced near the midpoint and less so near the ends. In order better to examine these vibrations a small electric light was fitted into the "larynx" so as to illuminate its interior. The device was then tested in the dark room. If one held the "larynx" with the rubber cap level and slightly below one's eyes with the slit at right angles to his line of vision, the vibrating edges presented an apparently continuous view of the lighted interior of the larynx. The opening seemed to be a pointed ellipse, showing that at some phase, at least, of each vibration the farther band was forced upward while the nearer was in a downward position. The 'larynx" was then turned around so as to present an exactly similar view with the edges reversed. The same phenomenon was observable.

Viewed through a stroboscopic disk these eliptical openings showed certain modifications. Although the view of the lighted interior of the "larynx" was still apparent from both

of the aspects described above, yet the stroboscope caught the bands at no phase in which their position revealed a pointed elipse of light. Rather the view of the interior began at one end of the slit and proceeded along the slit. By the time the movement had reached one end of the slit, closure of the edges had taken place at the opposite end. Under stroboscopic examination the most conspicuous phenomenon was that of closing edges apparently moving across the field of light.

From these observations it seemed quite clear that the vibrations of the artificial larynx were not parallel in phase but were opposite in phase, i. e., the movements of the two bands were exactly similar, but the beginning of the period of the movement of one band took place at mid-phase of the movement of its fellow. It was apparent, moreover, that each band moved, not as a whole, but in nodes traveling along the edge.

In view of the similarity between the tracings from the artificial larynx and those of the human larynx, are we justified in assuming that in the human organ the vocal bands also vibrate exactly in opposite phase? The fundamental objection to such an assumption is that the bands of one organ are dead rubber and those of the other are living tissue overlying and attached to musculature capable of movements independent of those produced by the force of the air current. There is no reason, on the other hand, to suppose that this difference of material would cause a difference in phase; but an argument based upon similarity is weakened if there exists any doubt as to the essential nature of the parallel. Thus it became necessary to duplicate the human larynx with an organ having bands of living tissue.

It was found possible to produce vibrations by blowing between the fingers. The most effective vibrating edges in the experimenter's hand were those formed by the tissue overlying the first and second metacarpals. Movements produced by blowing upon these edges were watched in a dark room with the hand illuminated by a stroboscopic light and with a mirror to reflect the image back into the experimenter's eyes. The movements were of the same nature as with the artificial larynx except that the opening between the fingers as seen under the stroboscopic light was not quite symmetrical, owing probably to the difference in structure between the tissue on the inside of the first finger and that adjacent to it on the second digit.

This experiment was again tried by blowing through a metal ring about the shape and size of the outer rim of the mouth piece of a bass tuba. The edges of the lips were seen to vibrate in close similarity to the vibrations of the rubber "vocal bands" of the artificial larynx. In this case the vibrating edges are structurally so similar to those of the true vocal bands that the German scientists have adopted for the latter the name of "voice lips" (Stimmelippen). As in the true vocal band, each lip presents a strip of muscle parallel to its edge covered by a moist integument.[5]

The next experiment was with a cadaver's larynx. A very large larynx from an old male was separated from its adjacent structures and cut away superiorly to a line parallel to and about five millimeters above the vocal bands. The stump of the trachea was mounted upon a piece of flexible rubber tubing so that a blast of air could be driven through the larynx. Its edges showed the same characteristics of vibration as the artificial larynx.

At this point the researcher left the laboratory for the library to learn whether any pronouncements had been made as to the relation between the phases of the two bands of the human larynx. He could find nowhere in print any statement on this point. No one, so far as is known, has ever made an investigation as to the phases of these movements, nor has anyone ever seriously considered the question, or in all probability he would have made some statement as to our ignorance on that question or would have given some hypothesis as an answer.[6]

As a problem in theoretical hydrostatics (for it is safe to treat of a gas in motion as a liquid so long as its coefficient of expansion is not one of the factors involved in the problem), given a stream of air flowing through a tube (trachea) into a larger open air space (pharynx), and at the point at which the tube gives egress into the larger air space a narrowing of the tube (larynx) across one dia-

[5] Attention should here be called to the fact that in all of the "brasses" among the wind musical instruments the lips are relied upon to produce the vibrations. The trombone, therefore, may be accurately spoken of as having a voice; for its tone is produced by the vibrations of living muscular lips or bands amplified and resonated by partially closed air chambers.

[6] In discussion of the matter with his colleagues, the researcher found that they were unanimous in assuming that the two bands were in phase; though why they made that assumption they could not tell. Evidently they assumed it merely on the basis that they had never questioned it.

meter such that the air must pass out between two elastic edges closely approximated one to the other (vocal bands); if the approximation in so close and the force of the air so great as to produce a vibration in the elastic edges, what would be the nature of the vibrations as regards their phases? As an analogue to this situation we have the "eddy" phenomenon of hydrostatics. If a swiftly moving stream is blocked by a dam at the middle of which a narrow orifice is cut, eddy currents (see figure 10) or whirls of water will form in the down-stream angle between the dam and the direction of the flow. On the right the whirl will be clockwise and on the left counter-clockwise. After each eddy has formed it will break away from the edge of the dam and be carried down stream until friction with the water around it has overcome its whirling motion. But the eddy on the right never breaks away simultaneously with that on the left. They exactly alternate. The explanation is that the pressure of the entire body of escaping water shifts from side to side. If, then, the edges of the dam were elastic they would be constantly bulged down stream, but would yield upstream whenever a strong whirl of water was formed below them to offset the downward force of the water, and consequently would yield alternately. This is precisely the condition we have in the larynx.

Consider another analogue illustrative of this shifting tendency of the force of a partly blocked stream. Hold a strip of paper, of any convenient length and about two centimeters in width, so that one of its shorter edges cuts the middle of the stream of air emerging from between the pursed lips. Blow vigorously and you will note the vibrations of the paper. It is on this principle that children produce a tone by blowing upon a blade of grass held between their thumbs so that its edge cuts the middle of the blast of air. If the air emerged from between the pursed lips in a steady, non-oscillating stream, the paper or the blade of grass would likely be blown to one side or the other and would doubtless remain there. The force of the air current in "mid-stream" would prevent the paper or grass from returning to its initial position. That such a return does take place is evidence that the area of greatest air pressure does not remain constantly in mid-stream, but oscillates from side to side. As this area moves back and forth it causes a corresponding movement (but in the opposite direction) of the edges of paper or grass. Substitute for the single edge of

paper, placed so as to cut the blast of air in mid-stream, two bands jutting from either side of the opening through which the air emerges. As the area of highest pressure shifts from side to side, first one band and then the other will be caught and outwardly displaced.

That such an alternate shifting of the pressure of air from side to side would take place in the larynx seems more probable when we trace the events leading up to phonation. It would seem that we have in the larynx factors predisposing to such behavior in addition to those producing the eddy currents around an inflexible dam. In the larynx, at the beginning of phonation, a strong blast of air is driven up through the glottis. The abductor muscles draw the bands gradually but swiftly together. It is not to be supposed that the right and left abductors are equal in strength, since disparity in size and force in paired organs seems to be the general rule throughout the body. Nor is it to be supposed that the two bands are held at equal tension or that they are exactly equal in size, or that the opening between them is placed exactly in the middle of the air stream. No one but a clinical laryngologist can appreciate how rarely even structural symmetry is discovered in the throat, to say nothing of functional symmetry. It is quite likely, then, that as the pressure below the bands increases one of them will first yield before the other. The instant one yields, it relieves the pressure on its fellow. The first band, being in upward and outward motion, continues until its own elasticity overcomes its momentum. Then it rebounds and, by pushing downward upon the air below it, causes a great rise in pressure upon the under surface of the second band, which now must perforce yield. From then on the phonation continues. If the initial vibrations are thus in opposite phase, what later factor could possibly be operative to bring them into parallel phase? To assume that the bands are parallel in phase would require the assumption of some such synchronozing factor, or the much more difficult assumption that the two bands would yield outward and upward at the same instant.[7]

[7] It is interesting to note here that both Johannes Mueller and H. L. F. Helmholtz constructed artificial larynges somewhat similar to the one described in this paper. (For an account of these experiments see "Sensations of Tone" by the latter, page 146, where the larynxes constructed by both men are described and compared).

"Cut the end of a wooden or gutta-percha tube obliquely on both sides,

leaving two nearly rectangular points standing between the two edges which are cut obliquely. Then gently stretch strips of vulcanised india-rubber over the two oblique edges, so as to leave a small slit between them, and fasten them with a thread. A reed mouthpiece is thus constructed which may be connected in any way with tubes or other air chambers. When the membranes bend inwards the slit is closed; when outwards, it is open. Membranes which are fastened in this oblique manner speak much better than those which are laid at right angles to the axis of the tube, as Johannes Müller proposed, for in the latter case they require to be bent outwards by the air before they can begin to open and shut alternately."

The last sentence of this passage is somewhat ambiguous. One might gather from the word "alternately" that the author meant to convey either that the bands moved alternately, or, on the other hand, that the opening between them was alternately open and shut. One is inclined to accept the latter as his real intent, when one notes that he says above that "when the membranes bend inwards, the slit is closed; when outward, the slit is open." The phraseology here suggests that they bent inward and outward together, for with alternate vibrations of the two bands, the bending of either band would have been accompanied by an opposite bending of the other band, and the slit between them would have been open. His statement here is meaningless, therefore, unless one understands him to be describing parallel movements of the two bands, for were he describing movements in opposite phase, he would have seen that the "glottal chink" was closed only when neither band was bent. (On the basis of his own experiments the present investigator is led to believe that the apparatus which Helmholtz here describes would not vibrate as simply as he suggests but would vibrate alternately and nodally, as described in Section III of this paper). Helmholtz had nothing to say about the question (very pertinent, if he considered that the bands vibrated alternately) as to whether the pitch of the tone produced by the artificial larynx was of the frequency of one band or of the combined frequency of the two bands. Further he made no application of the principle of alternate vibrations in his discussion of the human larynx and of the brass instruments, which immediately follows this section on the artificial larynx.

Tyndall, who reviews these experiments in his book on Sound, page 197, remarks no inconsistency of the two sentences cited above. We are inclined to believe, therefor, (1) that for both Tyndall and Helmholtz the phrase "before *they* can begin to *open* and *shut alternately*" means that the bands were thought to vibrate in such a manner as to cause the slit between them to be *alternately open* and *shut*, and (2) that the phrase has no reference to alternate vibrations of the two bands.

IV
MANOMETRIC FLAME EXPERIMENTS

At this point in the research the Koenig manometric capsule with the revolving mirror was employed.[8]

Although its wave forms are not as accurate and distinctive as those of the magnetophonoscope, yet, in that it yields an immediate picture of the wave form, it was convenient to use at this stage of the research, when only the gross outline of the curve was wanted. It was discovered that men's voices have characteristic double curves. These curves change with pitch and with change from one vowel to another, but retain their di-maximal (two-humped) shape. In each man's voice there seems to be a point of "maximum resonance" at which these humps appear to be of equal size and shape.

Next the stethoscope head was mounted on the speaking tube[8] in a manner similar to its adaptation to the magnetophone, so that the movements of the larynx could be seen. They, too, showed di-maximal curves.

Why should men's voices invariably show a strong first harmonic overtone, at certain points in the scale as strong as the fundamental itself? That such a phenomenon cannot be due to the shape of the resonators alone is evident when one notes the great differences in shapes of mouths, and when one bears in mind the fact that, in spite of the profound changes of resonator involved in changing from one vowel to another (from [ɔ] to [e] for example), the double curve persists. That it and the double curve on the magnetophonoscope, which first prompted this investigation, are both due to the opposition in phase of the vibrating bands is much more probable.

The Koenig manometric flame shows still another interesting phenomenon. If a man intones a vowel at a pitch that best resonates it (a pitch, of course, within the range of his normal speaking

[8] In this device a small brass chamber (the capsule) is divided into two compartments by a thin rubber dam. Through one compartment the gas flows under even pressure to a small jet. The other compartment is connected to a speaking tube, so that when sound waves travel into this compartment, they strike the rubber diaphragm and by bending it cause a change in the pressure in the gas compartment, and thus cause a change in the height of the jet of flame. By distributing the image of this flame across the observer's retina, the revolving mirror produces the curve. (See plate fourteen).

voice) it will be observed that the curves appearing in the revolving mirror are high, sharp, and regular, almost sinusoidal. Then, taking care to keep the mirror revolving at an even rate, he will note very little change in height and shape of the curves, and, if his second tone is an accurate octave above the first, absolutely no change in number of waves per unit of mirror space. Whereas one would expect, theoretically, that an increase of an octave in pitch would double the number of vibrations, they *appear* to remain the same in number. This *appearance* is due to the fact that, at the lower pitch, the single wave form is "doubled" so symmetrically as to *appear* to be two waves, while at the upper pitch actually twice as many complete vibrations are mirrored per second, yet there appears to be no increase in number. (See plate fifteen). (For a further elaboration of this point, see Sections V and VII).

When first noticed by the experimenter, this phenomenon was thought to be due to a natural periodicity of the diaphragm in the Koenig capsule, i. e., that the capsule had a rate of vibration to which it would most readily respond and that any vibratory frequency in harmony with that rate would set the diaphragm into vibration at its own normal rate. That this is not the explanation of the phenomenon became evident from experiments with other instruments producing tone. It was found that the saxaphone, throughout its range, would cause a gradual increase in the number of waves per unit of mirror space from the lowest to the highest notes, and that a rise of an octave exactly doubled the wave forms. The French horn, however, presented the same phenomenon as the voice. Certain "open" tones an octave apart appeared precisely alike. Were an observer tone deaf, he would have been unable to distinguish, by watching the curves, a series of "open" notes at the low pitch from a series of "open" notes alternating from this low pitch to the octave above it. Further proof that this phenomenon was not due to the priodicity of the capsule is found in the fact that with different men's voices the points of greatest resonance, i. e., the points where this symmetrical doubling of the curves is observed, are not found at the same pitch, as one would expect were the effects observed produced by the peculiarity of the capsule itself.

But why should the saxaphone and the French horn, both covering about the same range of pitch, show such fundamentally dif-

ferent wave forms, the former doubling in number with the first rise of an octave, and the latter passing through many intermediate irregular forms, until, at the end of one octave, the wave form returns to its original shape and number? In comparing these two instruments octaves were selected such that they could be taken without change of valves or stops. So far, therefore, as method of pitch change was concerned the instruments were comparable, except in one important particular, wherein, doubtless, lies the solution of the problem, viz., in that the saxaphone has but one vibrating body, while the French horn has two. It was a case of one reed against two lips. The two lips functioned like a man's vocal bands, while the one reed functioned as though it were a single vibrating body.

V

THE VOCAL RESONATOR

We come now to the point at which we must consider the relation between the fundamental vibration and the resonating surface or chamber. From facts already reported herein it seems evident that so far as the adult male's voice is concerned, the resonator has the function of responding to both bands when they are vibrating slowly enough, but, when their speed is doubled, the resonator has ability to respond only to one or the other of the two vibrating bands. This can be nicely demonstrated by returning to the artificial larynx, in which the cavity of pasteboard tube acts as the resonator. Let one use an ordinary open bell stethoscope. Remove the bell, so that one has a single small opening connected with both ear pieces. Let him hold this opening slightly above the cap of the artificial larynx. When the larynx is caused to vibrate, move the stethoscope tube back and forth across the diameter of the cap, at right angles to the slit. When the tube is held over the right wing of the cap, the tone is of the same pitch as that which one hears when he listens in the usual manner. When the tube is held over the left wing, so as to receive air waves only from that band, the pitch of the tone perceived is the same as though one were listening in the normal fashion to both bands. When one very carefully approaches the midline, however, a point is found where the pitch is perceived to rise an octave. (This phenomenon will not be apparent, if the opening of the tube is too large). As one crosses that line the pitch again falls. It is clear, therefore, that in normal hearing of such a tone the air waves that reach the

ear come as though from one band only. The tube, in the experiment just described, being held immediately over the bands caught very little of the resonance; but the ears unaided by such a device received the air waves that the resonance chamber is suited to amplify. Thus a man's pharynx, acting as a reasonance chamber for his larynx, selects the frequency to which it will respond. The same can be said of the relation between the tubes of the French horn and the vibrating lips of the musician who plays the horn.

There are other forms of double vibrations common to our experience that illustrate this same principle of selective resonance. The tuning fork is one illustration. When the fork. held in one's hand, is in vibration, two waves are sent from its surfaces in exactly opposite phase. When the prongs fly apart a "positive" wave starts from their outer surfaces, while at the same time a "negative" wave starts from between the prongs, i. e., when an area of condensation is leaving one point an area of rarefaction is leaving another. These points of origin of opposing waves can be located by the stethoscopic device just described. If one is careful one may also find areas in the air immediately surrounding the fork where the waves exactly neutralize each other, and one will hear no sound at all. Held in the hand, the fork can be heard but a short distance. Now mount the tuning fork on its resonator and set it in vibration. One will notice without using the stethoscope that the pitch is the same as though one were listening with the stethoscope to the vibrations from any single surface of the fork. The resonator, therefore, is selective.

The same principle is illustrated again by the mandolin string. When it is plucked to the right an area of condensation starts out in that direction propelled by the surface of the string. At the same time however, and area of rarefaction starts out in the other direction from the opposite surface of the string. Were the tone dependent upon these waves the mandolin would have very little volume when one's ear is held immediately over the string, for the two waves would neutralize each other. Obviously then, it is the resonator that is responsible for the tone perceived, for a mandolin string fibrating 256 times per second produces a tone of the pitch of middle C, in spite of the fact that 512 separate areas of condensation leave the string every second. Were it not for the selective function of the resonator the tuning fork and the mandolin string

would either be (a) inaudible due to the neutralization of opposing waves, as soon as they get in contact out in the open air space away from the generating surfaces, or (b) of a pitch one octave higher than they actually sound in our daily experience with them.

We have, then, arrived at a physical explanation of how 128 vibrations of each of the bands of the larynx is heard as C rather than ac C^1. Before we go father in the study it is necessary to consider somewhat the physiology of sound perception to note what interpretations the hearer automatically makes out of these resonated vibrations.

VI
TONE PERCEPTION

If a disk, mounted so as to be capable of revolution, is pierced with equi-distant perforations along the circumference of a circle whose center is the axis of the revolution, and a jet of air is thrown on the holes in sequence as the disk is revolved, a musical tone will be produced. Now, suppose this same number of perforations instead of being equi-distant are grouped in pairs, being kept, however, in accurate alignment along the circumference of the circle. If the speed of revolution is the same as before, a second note of different quality will be produced, but a note of a pitch an octave lower than the original. Perception of pitch, therefore, is dependent not upon the number of impacts per second but upon the number of *rhythmic units* per second. It is possible to group those perforations so nearly equi-distantly as to produce a tone that one hearer would perceive as C and another hearer as C^1. The same principle is observable by the trained ear in many "hums" produced by two corresponding parts of the same machine, when those parts are in opposite phase. If one attends to the sound of one of them the pitch seems to be an octave lower than when one places himself so that he receives the vibrations from both with equal volume. Such a phenomenon is made possible when both sounds are resonated by the same frame or floor or mounting. The operator of such a machine, noting a sudden change of pitch, knows that something has thrown off the adjustment of the phase of some moving part.

It is thus with the voice. Although one were to exclude the selective function of the resonator, still it is quite possible that we should perceive the pitch as though it came from one band or the other, for it is not conceivable that the two bands are either struct-

urally or functionally exact duplicates. Any difference in the intensity or quality of the vibrations of the two bands would cause the rhythmic unit to be made up of two impacts rather than of one. If our perception of the pitch of the voice were dependent entirely upon the number of vibrations per second (counting alternately first that of the right hand, then of the left), then the slightest bit of mucus falling on either of the bands would change the quality of the tone as well as lowering its pitch an entire octave. Thus this principle of perception reinforces the selective function of the resonator.

Again, were the tone produced dependent upon the number of vibrations per second counting those of both bands separately, patients with only one effective vocal band would have voices an octave lower than normal. Such, however, is not the case. Their voices are of normal pitch, but breathy, due to the escape of air on the side on which the glottis fails efficiently to close. Still another factor involved here is the principle stated by Helmholtz:

"It was necessary to compound various musical tones out of simple tones artifically, and to see whether an alteration of quality ensued when *force* was constant but *phase* was varied. . . .

"Hence, the answer to the proposed question is: the quality of the musical portion of a compound tone depends solely upon the number and relative strength of its partial simple tones, and in no respect on their differences of phase."[9]

This means that the ear is so accurate a device for analyzing tones that no matter what the wave form is that strikes the drums it perceives the component tones. The ear, then, reacts to partials as though they were isolated tones rather than as though they were compounded.[10]

The present experimenter developed the following illustration of this ability of the perceptive apparatus to make phasic adjustments: Insert into the two ears two rubber tubes of equal length. Set a tuning fork in vibration. Hold the open ends on opposite

[9] *Sensations of Tone*, page 184.

[10] Given two series of waves at the same pitch but of different form. They are perceived as unlike, presumably through the different reaction of the ear drum to those different forms. Now let their difference in form be caused simply by a difference in phase. The ear is now unable to distinguish a difference, even though the wave forms are as divergent as before. Problem for future research: How can it be?

sides of one of the prongs of the fork. (See plate sixteen). Thus the vibrations come to your ears exactly out of phase. Pinch off one of the tubes. The sound remains the same in pitch, but is reduced in volume. Thus, in spite of the fact that we are listening to two series of unresonated impacts, exactly out of phase, and of exactly the same intensity, they blend in so far as to appear to be one tone. The remarkable fact is that in this blending process the composite tone is altered as to one element, volume, but is in no wise altered as to the element of pitch.

Even the quality of tone appears unchanged by alternately opening and closing one of the tubes. It is exactly as though a sound coming from one source to both ears alike were suddenly increased and decreased in volume. What neural process is so selective as to combine two series of impacts from the two ears and yet keep them separate at the same time is not clear.[11] But that it is a normal process of perception is evident from the fact that any tone coming from the right or the left strikes the two ears out of phase. Binaural perception corrects this difference of phase. We have become so accustomed to the making of this adjustment of phase, that when we listen to music over the radio our auditory perception is robbed of its spatial dimensions. Recent developments in radiocasting have perfected a machine for sending provided with two microphones spaced as far apart as one's ears, and each tuned to a separate receiver one for each of the listener's ears. The effect of this device is to enable the listener to perceive the spatial arrangements of the players on the stage and to take cognizance of their slightest change of position. The several instruments stand out sharply distinct one from another as they do when actually present to the sense.

Just as perception makes adjustment for differences of phase of sounds coming to the two ears, so it also makes adjustment for differences of phase received by both ears alike, in accordance with the principle from Helmholtz stated above, and thus another factor

[11] Wheatstone in his "Scientific Papers," page 33, calls attention to a similar phenomenon: that when two forks in unison are vibrated before the two ears, the sound is perceived as louder than when the two forks are held before the same ear; *yet* two forks slightly out of unison will present the phenomenon of the "beat tones" when the forks are held before the same ear, and will not show this phenomenon when the two forks are held before the two ears.

is operative in making one tone out of the two vibratory series from the two vocal bands.

VII

VOCAL SEX DIFFERENCES

It has been found that men's voices, as stated above, show the phenomenon of double curves at normal pitch and at high pitch single curves. This appears both on the tracings of the magneto-phonoscope and on the mirrored curves of the Koenig manometric capsule. The voices of women, of girls, of boys before puberty and of men at a high pitch show single curves. We must look, then, for an explanation of the difference, in the one organ of voice that is significantly divergent in adult males from the norms set by women and children. A man's larynx is on the average about twice as large in antero-posterior dimension as that of the boy just before puberty, while a woman's larynx is only slightly larger than the boy's. It is obvious that we could not assume that in a man the bands are out of phase and in women they are in phase, and thus explain the single curve of the woman's voice.

The explanation must hang upon the relationship as to size between the vocal bands and the resonance chamber. That the resonance from the buccal and nasal chambers is not an important factor here is evidenced by the fact that when the mouth is largely closed off as on [ŋ] the double curve persists, also when the mouth and nose are both open as in the French nasal sounds, and yet again when the nose is closed off by the palate and the mouth resonance is employed in all of its widely divergent forms. Pharyngeal resonance, then, with perhaps some from the tracheal and bronchial tree must be the controlling factor that we seek. To state the answer backwards, when the pharynx is small enough *in relation to the length of the vibrating bands*[12] it is able to respond to both of them (the shorter a resonator, the faster its period of response).

[12] Gray's "Anatomy" gives the relative size of the average larynx in antero-posterior dimentions (which would be a measure of the length of the vocal band) as 36 m. m. for the male and 26 m. m. for the female. In other measurements the male's larynx is only slightly larger, about as much larger as his size in general would necessitate to preserve relative proportions. Luschka in his "Der Kehlkopf des Menschen" reports figures on the length of the glottal slit as being 25 m. m. for the male and 15 m. m. for the female. I have been unable to find any writer who had noted any but the slight normal difference in the size of the male and the female pharynx.

With relation to their respective larynges, a man's pharynx is smaller than a woman's. Her resonance responses would therefore, be slower in relation to her laryngeal rate than his. Considering one vibration as involving two movements, one from each of the vocal bands, he has the greater ability to resonate and amplify these separate *intra*-vibrational elements. Such is the speed of her larynx, a woman's pharynx can best respond only to the *inter*-vibrational elements, i. e., to the simple fundamental vibration. There is, of course, a strong tendency on the part of a comparatively fixed resonator to force the vibrator into a frequency in harmony with its own frequency; thus any given person finds it most convenient to speak either at a high pitch where the resonator can best respond only to one of the two laryngeal movements that make up the fundamental vibrations, or at a low pitch, where the resonator can respond to both of these movements. Since pharynges are not greatly different in size in the two sexes, the two registers are an octave apart, and were they of exactly the same size the difference would doubtless be an exact octave. Thus has the nature of the laryngeal vibration influenced our vocal music, reinforcing the importance of the octave.

In the light of the principle of the perceptive adjustment of the phases of component tones, what can be said about the tones produced by the two vocal bands? That the tones do not neutralize each other is evident without further demonstration. We hear them; that is sufficient evidence. That they do not change the pitch from what it would be were only one band vibrating can be inferred from the magnetophonophotographic records. In accordance with the principle just enunciated, the faculty of perception combines the two tones so as to alter the quality of neither. (This assumes that the two bands have the same quality, probably a practical rather than a theoretical assumption. If the two bands are slightly different in quality, it is quite probable that in the combination of tones these two different qualities would fuse so as to make a third quality not like either of the two component tones. Whether the difference would be great enough to be perceptible, it would be difficult to say). In their combination, then, the two tones are altered neither in pitch nor in quality. It seems inevitable, however, that two bands would make a greater disturbance in the air than one, unless the action of one neutralizes that of the

other. Inasmuch as the resonator prevents this neutralization, the resultant sound is chiefly altered by an increase of volume from that which would be produced by one band. In some parts of the body one or the other of paired organs seems useless except as a reserve, but in this case both function, but, though functioning alternately, function as one. The factors responsible for this fusion are resonance and physiological considerations mentioned above and elaborated below.

We have said that "it seems inevitable that two bands should make a greater disturbance in the air than one." One should not infer from this statement that the amplitude of any single vibration would be greater, or that the wave form when plotted would show any higher peak than would be produced by the action of a single band. Rather, we mean that the vibrations, though not greater in amplitude, would be greater in the amount of energy communicated to the air molecules displaced by the vibrations, and hence would cause a greater activity of the ear drum upon which that energy is expended.

Miller (Science of Musical Sounds, page 53) gives us the following statement as to the physical meaning of loudness:

"The energy, or what we will call the intensity, of a simple vibratory motion varies as the square of the product of amplitude and frequency; or to express it by a formula, representing intensity by I, amplitude by A, and frequency by n,

$$I = n^2A^2$$"

The vibrations in a man's larynx have greater amplitude than those in a woman's due to the greater length of his vocal bands. On the other hand, the frequency of a man's voice is lower, probably due to the same cause and thus probably to the same degree. One might expect, therefore, that the voices would be of equal intensity, since what the man's voice gains in amplitude it loses in frequency. Yet it is a matter of common experience that a man's voice possesses greater volume than a woman's. One of the explanations of this apparent paradox is that the law stated above applies only to "simple vibratory motion," while the motion of the larynx is diphasic. The resonator damps out one of the phases of the woman's voice, but amplifies both of them in the man's. (See Section VII). Inasmuch as the two phases of a man's voice are equivalent in a single vibration to two vibrations of a woman's,

and their amplitude is greater, his voice has greater intensity; that is more energy is communicated to the air waves.

Thus the two bands in the larynx function to give the voice greater power than would be possible were the larynx constructed as a single reed instrument, for power of tone is partly a matter of perception, and the ear functions as an instrument not only for the measuring of the amplitude of a vibration, but also for the measuring of the amount of energy expended during that vibration. A double movement of the ear drum within a single vibration is interpreted by the ear as evidence of an expediture of a greater amount of energy than would have been necessary to have produced a single movement of the same amplitude in the same time. It is not only the degree of displacement of the drum that determines the perception of volume, but the frequency of that displacement, and the volume increases with every additional displacement, whether that displacement means an increase in pitch or an increase in the number of intra-vibrational movements with no increase in pitch. Tracing the effect one step farther, we can say that the diphasic vibrations of the larynx possess greater volume than monophasic vibrations in that they cause a double stimulation of the auditory center. This double stimulation is interpreted in terms of loudness just as in the experiment with the diphasic tuning fork, alternate stimulation from the two ears was so interpreted. It is this sort of volume, measurable in terms of energy effective in stimulation of nerve-centers rather than in simple amplitude of vibration, that Seashore[13] calls the volume-complex in contra-distinction to simple intensity.

We have spoken of the similarity in function between the man's vocal apparatus and the French horn or the trombone. We have said that the primary similarity lies in the fact that in both instruments the vibrators are double, and that the secondary similarity lies in the fact that in both there are sets of "open" tones separated by octaves. In the human voice this secondary difference does not obtain until the boy's puberal change. Consequently he has to learn how to play his new instrument. Before puberty his most convenient pitch is that in which his relatively large pharynx (large in relation to his vocal bands) can respond to every complete vibration, i. e., to a complete laryngeal cycle of both bands. After

[13] *Psychology of Musical Talent*, page 165.

puberty, his most convenient pitch is that in which his relatively small pharynx can respond not only to every complete vibration, but also to every intra-vibrational movement. Thus the general range of frequency, i. e., the register, is determined by the length of the vocal bands; and the pitch, by the size of the pharynx. These changes come about suddenly. The lad has to learn a new technic of adjusting the larynx to the pharynx, and while he is learning his new technic, he shows the same tendency that a learner on the trombone demonstrates, to slide from one octave to the next. Both can learn more quickly to control the key than to control the register. In some the pubescent voice change is so sudden as to make the transition stage imperceptible. James Hunt in his work, "Stammering and Defects of Speech," page 103, states: 'It is said that the celebrated Lablache (a choir boy) found his voice changed into an excellent bass in a single night, after having, on the previous day, taxed his voice to the utmost at a festival of the church." Two cases of interest here might be cited from the study of the present investigator. One was a boy who, for five years after puberty, continued to talk in the upper register. After taking certain exercises for relaxation of his throat, his voice changed into a deep bass overnight. Another was a man whose voice never changed except for sustained or vigorous notes. When he either sang or shouted his voice was bass, otherwise it was than of his ante-puberal days. He was like some trombone players whose notes suddenly shift an octave, if they blow hard.

I have spoken of the new technic that the lad must learn at puberty for the control of pitch. The man's technic differs from woman's and children's in a way that may be easily demonstrated. Place the finger tip in the narrow V-shaped indenture between the thyroid cartilage and the hyoid bone, i. e., just above the Adam's apple. Intone the sound [ɑ:] beginning at a low pitch and continuing gradually to a high pitch. It will be noted that in men the thyroid cartilage is drawn backward and upward as the pitch rises, while in women practically no change takes place in this thyro-hyoid relationship. In the cases of both men and women pharyngoscopic examination during phonation will reveal a general tensing of the constrictor and the levator pharyngeal musculature.

Here again the parallel between the human voice and the wind musical instrument will be noticed. With the human voice as with the cornet, pitch adjustments are partly adjustments of the vibra-

tor and partly of the resonator. With the bands in a given tension the particular shade of pitch is dependent upon the size of the resonator.

VIII
THE SUBJECTIVE FUNDAMENTAL

But we must return to the physiology of voice perception. Another subjective consideration (or perhaps it is but another way of saying what has been state above, see section VI) involves the problem of the perception of the fundamental. The vocal sounds are not entirely dependent upon what they are physically. In part they are what they are perceived to be, and even so basic an element as the fundamental varies with our perception of it. Objectively the fundamental is the lowest frequency involved in a tone. That such a definition does not hold for the subjective phase is evident from the following experiment on the piano: Hold down the "sustaining" pedal of the pianoforte. Strike simultaneously C^1 and C. Damp those two strings with the fingers. A tone continues because the rest of the bank of strings has been set in sympathetic vibration with the two strings struck, and continues in such vibration after those struck have been damped. This continuing tone has a subjective fundamental of C, even though the C string has ceased and even though C^{-1} is also in vibration. That C^{-1} is in action may be demonstrated by feeling; or by damping all the strings above it, when the residual tone is clearly lowered in perception to C^{-1}.

This subjective fundamental is the principle involved in the apparent differences in pitch among the separate vocal sounds. A tone of a definite physical pitch may be altered so as to appear higher or lower by uttering, while intoning it, a series of vowels, nasals, and liquid consonants. It is the laryngo-pharyngeal relation, therefore, that determines the physical fundamental and pharyngo-nasal and pharyngo-buccal relationships that largely determine the subjective fundamental. The commonest demonstration of this is the jew's-harp, a small lyre-shaped instrument, provided with a stiff metal tongue, which when struck causes an almost inaudible hum of a very low pitch. When however, the instrument is held between the teeth, with the lips open, the buccal chambers resonate and amplify the various harmonics of this inaudible fundamental so as to create the effect of music as the shape of the mouth is altered from one resonance to another. Another illustration of the subjective fundamental is the apparent change in pitch of the

voice reproduced on the soft-wax phonograph. The physical fundamental has been diminished, and hence the subjective fundamental stands out more prominently. For the same reason [æ] has a much higher subjective fundamental than [u:], even though they are uttered at the same pitch.

The fundamental difference between the resonating functions of the naso-buccal chambers on the one hand and pharyngeal chamber on the other should here be emphasized as an introduction to the problem of vowel pitches. While the former act merely to change the hearer's impression of the pitch of the voice, the latter not only participates in this function, but acts to control and to change the numbers of vibrations per second of the vocal bands. Aside from its function of modifying the subjective fundamental the pharynx acts like the various lengths of resonating tubes in the trombone to *force* a vibratory note in harmony with its periods, while the mouth takes the tone delivered to it from the pharynx merely to alter its "sound." That the nasal and buccal chambers do not have any direct influence upon the larynx to control its periodicity is evident from the fact that we may open or close or modify in shape, singly or separately, the chambers of the nose and mouth without modifying the frequency of the laryngeal vibrations. That the pharynx, on the other hand, does not participate to any large extent in the modification of this subjective fundamental, upon which the vocal sounds are partly dependent for their characteristics, is evident from the fact that, so far as we can tell from external palpation very little pharyngeal adjustment accompanies the change from one vowel to another, except in the cases of vowels whose utterance involves muscles attached to the pharynx or larynx itself. From the styloid process on the cranium to the sternum is a series of muscles dependent upon these two points largely for their anchorage. Many of the muscles in the series have no skeletal anchorage but pull upon points of origin and insertion that are dependent for their stability upon the functioning of muscles attached to the two points of anchorage mentioned above. Thus a movement even of the palatal muscles is not without its effect upon the entire series. But, aside from these borrowed movements, the pharynx seems not to participate markedly in vowel changes.

With this in mind we can insert a table of vowel pitches adapted from "The Science of Musical Sounds," (pages 226-227) by D. C. Miller.

VOWEL PITCHES

Showing Frequencies Responsible for the Subjective Fundamentals

VOWEL	PRIMARY FREQUENCY	SECONDARY FREQUENCY
[u:]	326	
[ou]	461	
[ɔ:]	732	
[ɔ]	910	
[ɑ:]	1050	
[æ]	800	1840
[e]	691	1953
[ei]	488	2461
[i]	308	3100

It is because each vowel has its subjective fundamental that the vowels can be distinguished even in whispering, where there is no laryngeal fundamental at all.

Another interesting factor of tone perception is the tendency on the part of the hearer to bring uniformity out of irregularity. Just as with vision there is a tendency to perceive objects as round that are almost round and to complete and extend any regular pattern that appears as a part of the field of vision, so with hearing. We have a tendency to perceive as a musical tone a series of vibrations greatly divergent in frequency provided there is a dominant frequency which appears from time to time throughout the series. Curve C on plate thirteen is the picture of a tone that sounded true and steady, yet one can notice great differences in wave length. This is what on might expect from the nature of the violin vibrator, a string that catches and slips, catches and slips, over and over again, under the pressure of a resined bow. As the bow is not of even "stickiness" throughout its length, the string is not always held the same length of time. Great disparities were also found in the length of the voice waves. These differences were doubtless due to muscle tremors in the chest, larynx, or pharynx. Nevertheless these tones sounded true to pitch and steady of control.

IX

CONCLUSIONS

1. That each cycle of laryngeal vibration consists of one complete movement of each of the two vocal bands, and that these two movements are in opposite phase.

2. That the human voice is more like the brass wind instruments, i. e., instruments in which the vibrations are furnished by the lips, than any other musical instrument.

3. That vocal sounds are:

(a) controlled in pitch partly, at least, by the adjustment of the pharynx.

(b) given their characteristic speech forms by nasal and buccal resonance (in addition to the non-vocal explosive and frictional factors).

APPENDIX

—A—

Concerning the Functioning of the Sinuses in Voice Production

In the course of this study some 200 persons were examined with the stethoscope as to the resonating function of the maxillary and frontal sinuses. The theory of the examination was this: A stethoscope laid over any part of the known resonance area of the speech apparatus, that is, the larynx, the throat, the cheeks, the floor of the mouth, the nose, etc., communicates a distinct vibration to the observer's ears, when the underlying resonance chamber is functioning. On the vowels a distinct tone is heard when the stethoscope is laid on the cheek, but no sound when the stethoscope is laid on the nose. With nasal sounds, however, a tone is heard from the surface of the nose. Assuming, then, that the vibration of the surface is a fair index of the resonance of the underlying chamber, we laid the stethoscope over the sinuses in question. Five persons were found out of the group of over 200 in which there was certain evidence of greater vibration over the sinuses than over the solid areas contiguous to them. In the rest of the cases, no evidence of sinus vibration was found. These cases presented as a class no peculiarity or defect of speech distinguishing them from the five with sinus resonance. Seven cases of infected sinuses were studied. In these cases no vibrations emanated from the surfaces of the infected sinuses. These presented no defects of speech that could not be accounted for by nasal stenosis caused by pathological conditions associated with the sinusitis. The con-

clusion was that the sinuses play no *important* part in voice production.[14]

It may be argued that the bony nature of the sinus in the great group of the cases studied prevented the vibrations from reaching the surface. In answer to that contention it should be pointed out that vibrations can invariably be gotten from the mandible (a bony structure of great thickness).

—B—

Concerning Various Methods of Voice Recording and Analysis

The curves presented with this dissertation show, with one exception (see plate twelve) monophasic or diphasic curves. It is unusual for either the magnetophonoscope or the Koenig capsule to show polyphasic curves. A comparison of the curves from these two instruments reveals great similarities. The magnetophonoscopic curves are the more detailed and distinctive, but show the same gross characteristics.

Properly to evaluate the magnetophonoscope, a brief statement of its place in the evolution of voice recording apparatus should be made.

The Scott-Koenig phonautograph is the simplest of recorders, consisting of a diaphragm, activated by the voice, to which is attached a stylus for tracing a curve upon a kymograph. Naturally the device is much hampered by friction of the tracing point.

The oscillograph is an attempt to obviate this difficulty of tracing friction. Instead of using a stylus lever, a beam of light is used as a lever. This beam is thrown from the mirror of a recording galvanometer on to a sensitized photographic paper. The momentum and inertia of the mirror, light as it is, are serious sources of error.

The phonodeik, invented by D. C. Miller, is a still simpler modification of the phonautograph. The mirror is placed in direct connection with the diaphragm of the mouthpiece displacing the stylus and thus obviating much friction. Recording is done photographically. But this, as well as the other devices, possesses the

[14] This conclusion is in conformity with that of Dr. G. N. Merry as reported in his article, "A Roentgenological Method of Measuring Voice Resonance," QUARTERLY JOURNAL OF SPEECH EDUCATION, Vol. V, page 26.

serious weakness of having to make a tracing at the time of utterance of the tone to be studied. The high speed of the vocal vibrations makes the problem of the inertia, momentum, and friction of the tracing stylus or mirror a very serious one.

Hence Scripture and Merry separately developed devices for the tracing of phonograph records. A needle is made to follow the record groove and to activate a long lever that carries a stylus tracing on a kymograph. Such a device is, however, but a form of pantograph for the enlargement of what are virtually phonautographic tracings. It possesses all of the inaccuracies of the phonautograph and those besides that are always present in the pantograph, due to play in its joints and torsion of its levers. It has, on the other hand, an advantage not possessed by any of its predecessors, namely, that the curve written is a picture of a curve that can be returned into voice by placing it upon the phonograph.

The magnetophonoscope is virtually an oscillograph in so far as it makes use of the same sensitive microphone and electrical assembly used by the Bell telephone, to which is added the devices for recording magnetically and for making photographic tracings of the magnetic record. (1) It employes the frictionless beam of light of the phonodeik and the oscillograph. (2) It possesses the advantage of the Scripture machine in that tracings can be made at a sufficiently slow rate to obviate the errors of speed as pointed out in the case of the first three devices. (3) It possesses also the advantage of voice reproduction of the Scripture phonograph assembly.

Workers using voice recording apparatus have often included in their reports the statement that women's voices did not record well. This was particularly the complaint of those using the phonautograph and the Scripture machine for tracing phonograph records. They often complained that women's voices gave practically sinusoidal curves (single "humped"). Such was the belief of the present investigator during his first experiments with the magnetophonoscope. He believed that the frequency of the woman's voice was beyond the efficient limits of the recording instrument. Later research as to these limits, however, convinced him that such was not the case. A violin record (See figure 25) showing clearly partial vibrations of 1/5000 of a second demonstrated that the sinusoidal appearance of the curve of a woman's voice is due not to the

limitations of the machine but to the real character of the sound waves her voice produces. This is confirmed by work with the Koenig capsule, which is demonstrably capable of vibrations fast enough to catch the double vibrations of a woman's voice, were such present.

Of recent years the most important analytical work is that with speech sounds done by D. C. Miller of the Case School of Applied Science. His records, shown in his work "The Science of Musical Sounds" very frequently show three or more distinct maxima on each wave form. There is one peculiarity, however, about most of his curves: viz., the several maxima or "humps" are arranged in a regular descending series, the highest "hump" first, then the next highest, etc., precisely as though the recording apparatus were vibrating of its own momentum while coming to rest. Examples of this are numerous. See figures 108, 109, 152, 154, 167 (a), 181. Out of 28 photographs of periodic curves (exclusive of those of tuning forks), 9 have a clearly descending order of "humps," 1 shows an ascending series, 8 show neither, 10 are either single or double. Out of 8 that are clearly double curves. 6 are of the human voice. In figure 120 he gives curves that show distinct family resemblance to the ones cited as "descending" and these curves are admittedly those of the diaphragm itself, curves produced by but a single impact, showing the tendency of the diaphragm to vibrate while coming to rest. The question, then, is: are all of the "humps" on the phonodeik curves measures of changes in pressure in the voice wave itself, or are some of them artifacts due to the behavior of the diaphragm, amplifying or diminishing or adding to the real wave forms?

Professor Miller's analysis of the vowel sounds should be questioned further: That he is not a phontician is plainly testified to by the following sentences taken from pages 217-218 of his book cited above.

"Helmholtz specifies seven vowels, the Century Dictionary gives 19 vowel sounds in its key to pronunciation, while some writers on phonetics tabulate as many as 72 vowel sounds. After preliminary study, eight standard vowels contained in the following words were selected for definite analysis: *father, raw, no, gloom, mat, pet, they, bee.*" He then goes on to tell how these vowels were studied.

"The speaker begins to pronounce the appropriate word and prolongs the vowel in as natural a manner as possible."

That such a technic is not entirely possible is evident when one notes that two of the so-called vowels are dipthongs, viz., those in *no* and *they*. How can a dipthong be prolonged and subsequently analyzed, except part by part? The one who uttered these two sounds into the phonedeik probably either mis-pronounced the words or prolonged one of the two elements in each sound. Such methods would cause one to question the findings based upon the analysis of curves so produced. All of which emphasizes the importance of possessing a speech-trained ear and a knowledge of phonetics, if one is to make vowel analyses.

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PLATE ONE

THE MAGNETOPHONOGRAPH

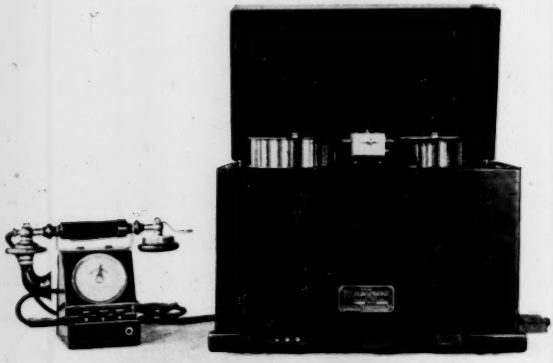


FIGURE ONE

MICROPHONE OR TRANSMITTER

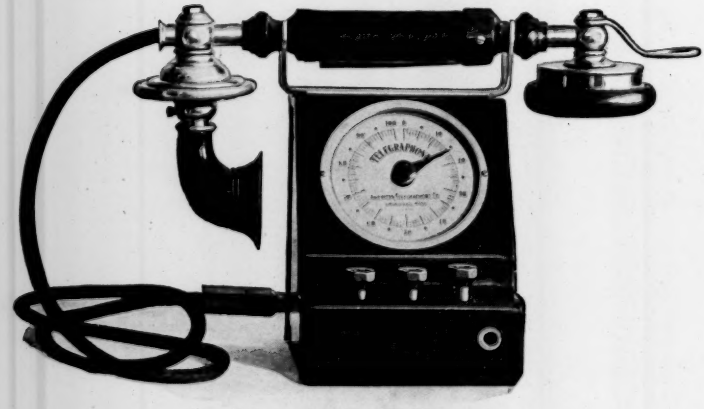


FIGURE TWO

PLATE TWO—FIGURE THREE

SCHEMA OF ESSENTIALS OF THE MAGNETOPHONOGRAPH

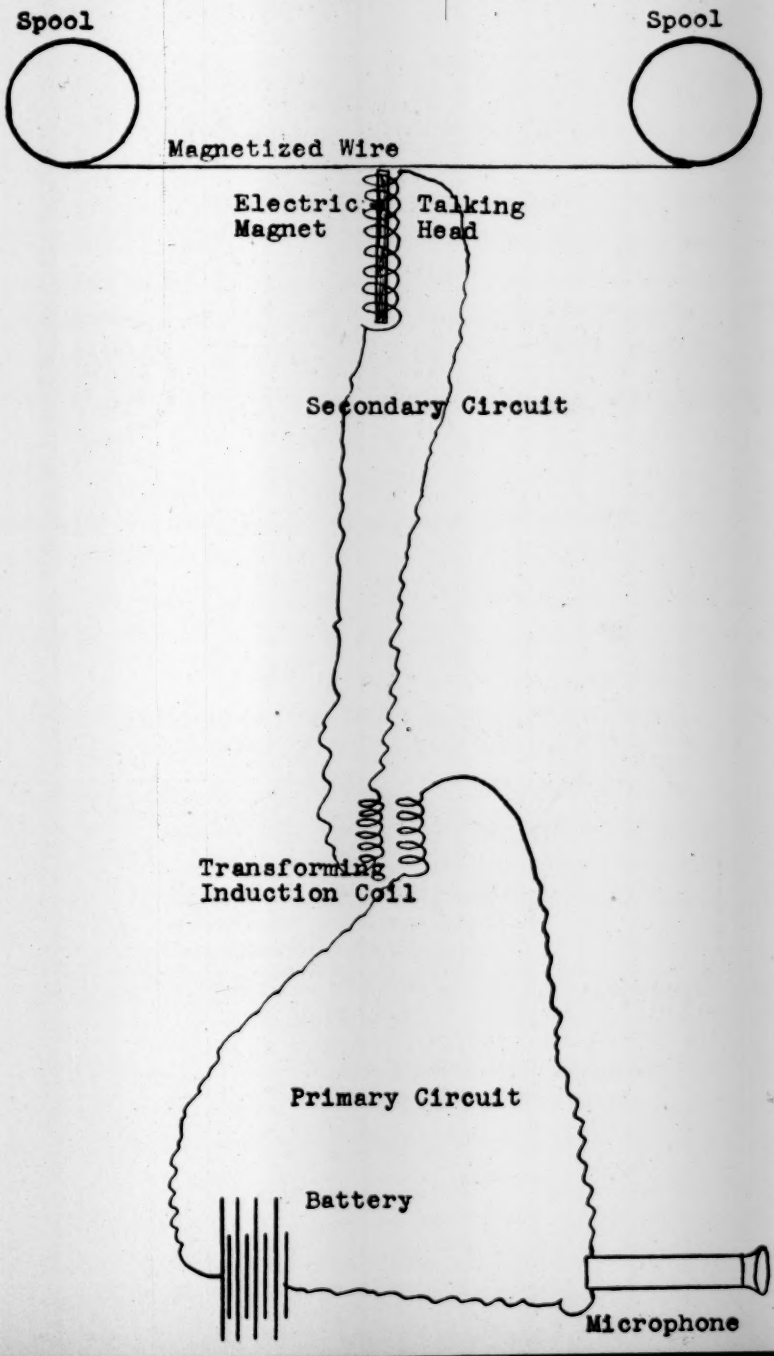


PLATE THREE

SCHEMA OF THE MAGNETOPHONOSCOPE

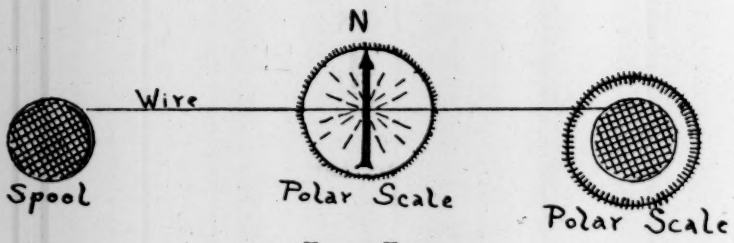


FIGURE FOUR

Diagram showing the relations of the component parts in the simplest form of the magnetophonoscope.

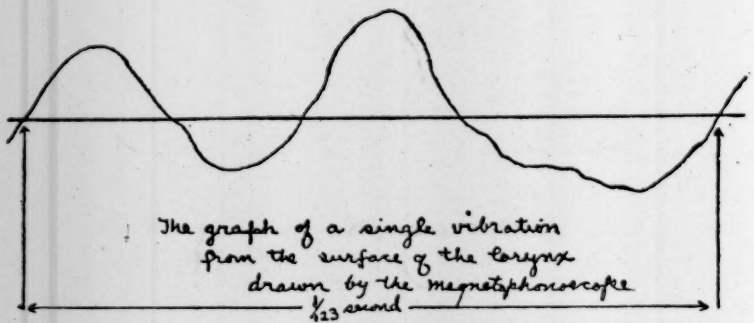


FIGURE FIVE

PLATE FOUR—FIGURE SIX

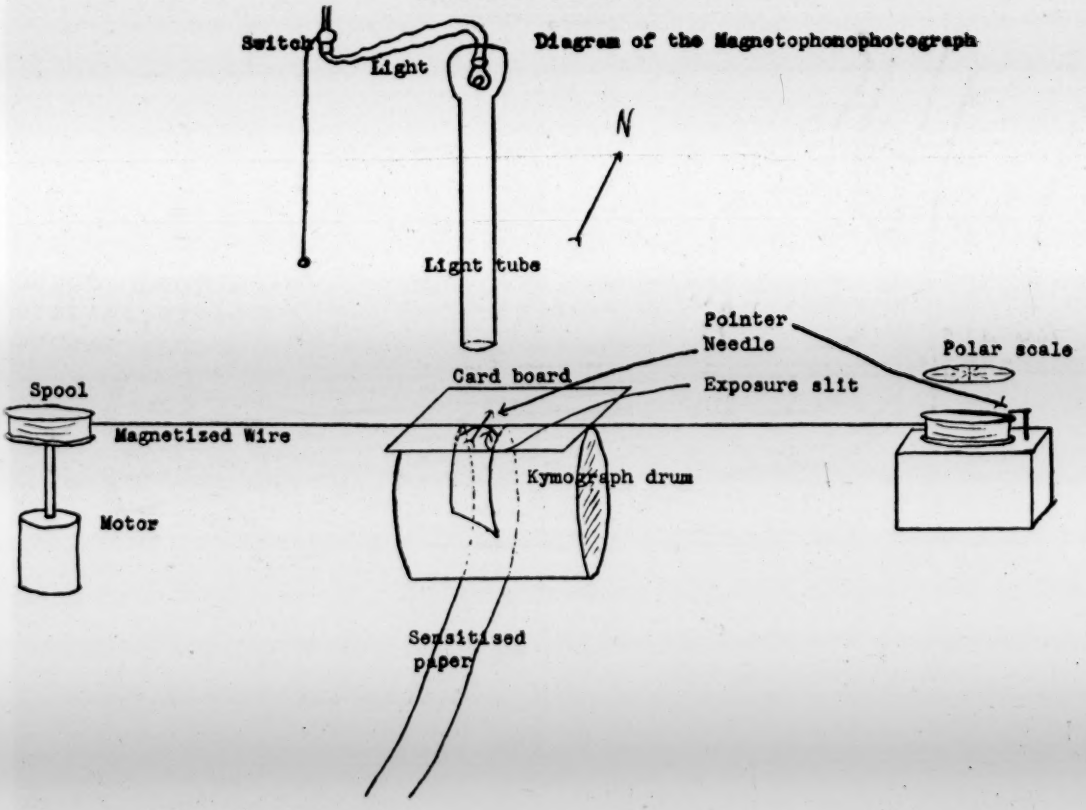


PLATE FIVE

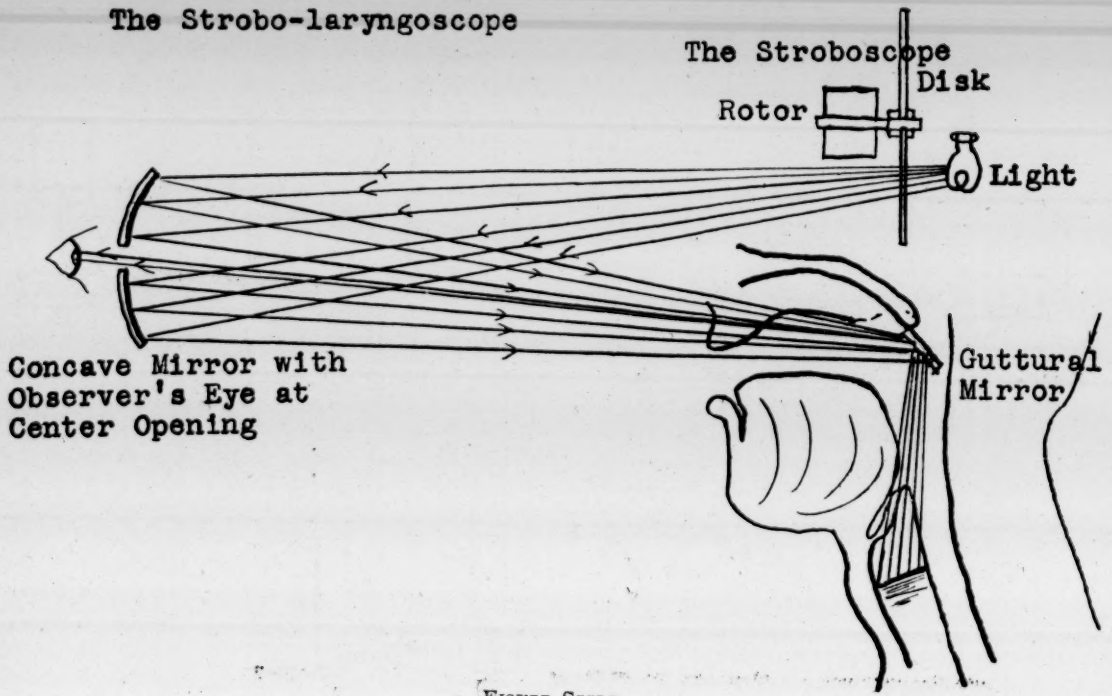
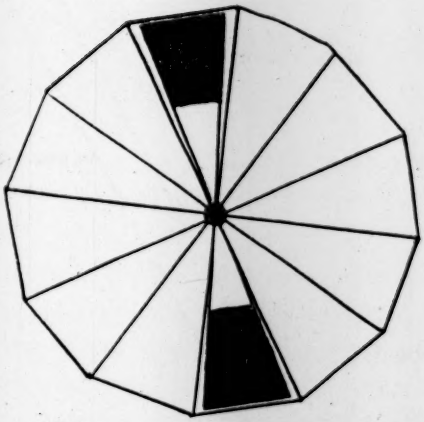


FIGURE SEVEN

Details of the Stroboscopic Disk



The two Black Segments are Open as shown.
The rest of the Disk is Opaque.

FIGURE EIGHT

PLATE SIX

The Artificial Larynx

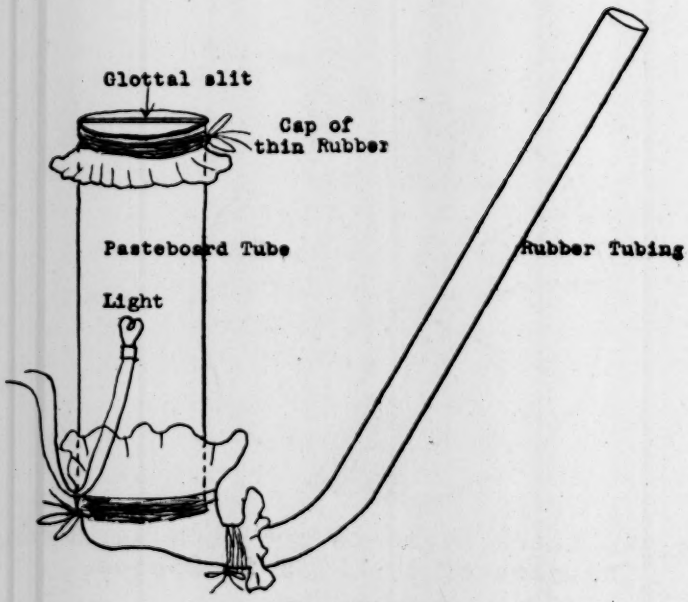


FIGURE NINE

Schema to Illustrate the Alternate Eddy Formation
Eddies
Stream of water
Dam

FIGURE TEN

PLATE SEVEN

A is a tracing made from the outside of the human larynx.
B is a tracing made from the outside of the artificial larynx.
The intersecting lines are time lines. The sound uttered in A was (ə), as in sofa. Note the similiarity between the two curves. These and the following plates showing magnetophonophotographic tracings are engraver's positives made from the original negatives.

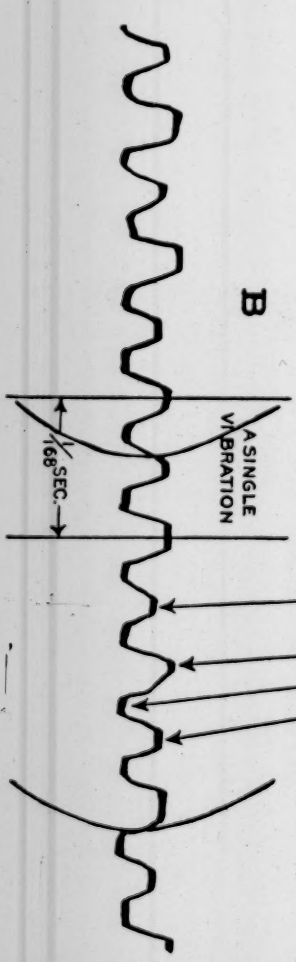


FIGURE ELEVEN

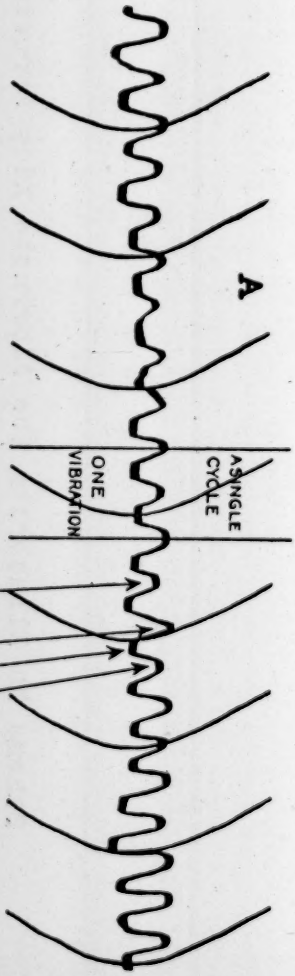


FIGURE TWELVE

PLATE EIGHT

A magnetophonophotograph of the movements of the surface of the larynx. Note the signature, which was photographed onto the record at the time it was made, to prevent error. Identifying notes were entered in the log book under this signature. The sound uttered here was (ɔ), as in sof*a*.

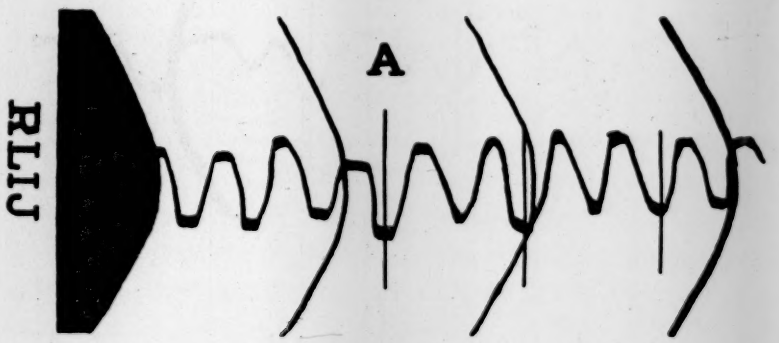


FIGURE THIRTEEN

A similar picture to that above, this one made from the artificial larynx. The only essential differences that appear here are those caused by differences in the technic of photographing, i. e., the speed of the motors, excursion of the needle.

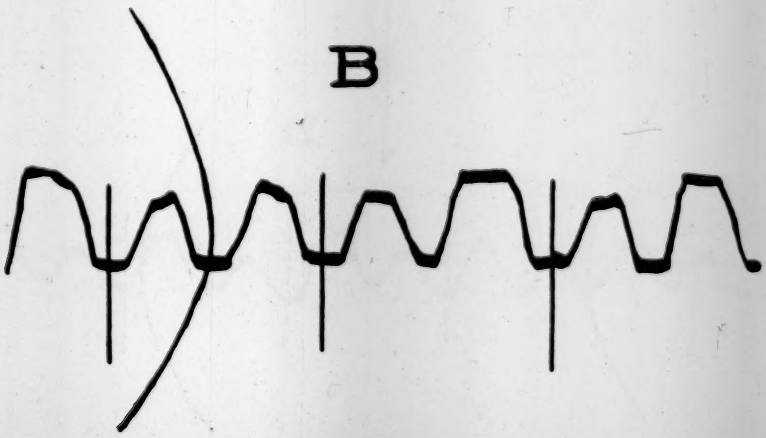


FIGURE FOURTEEN

PLATE NINE

Comparison of the natural and artificial larynges as to movements during phonation. Figure 15 is of the natural larynx phonating [n], as in moon. Figure 16 is of the artificial larynx.

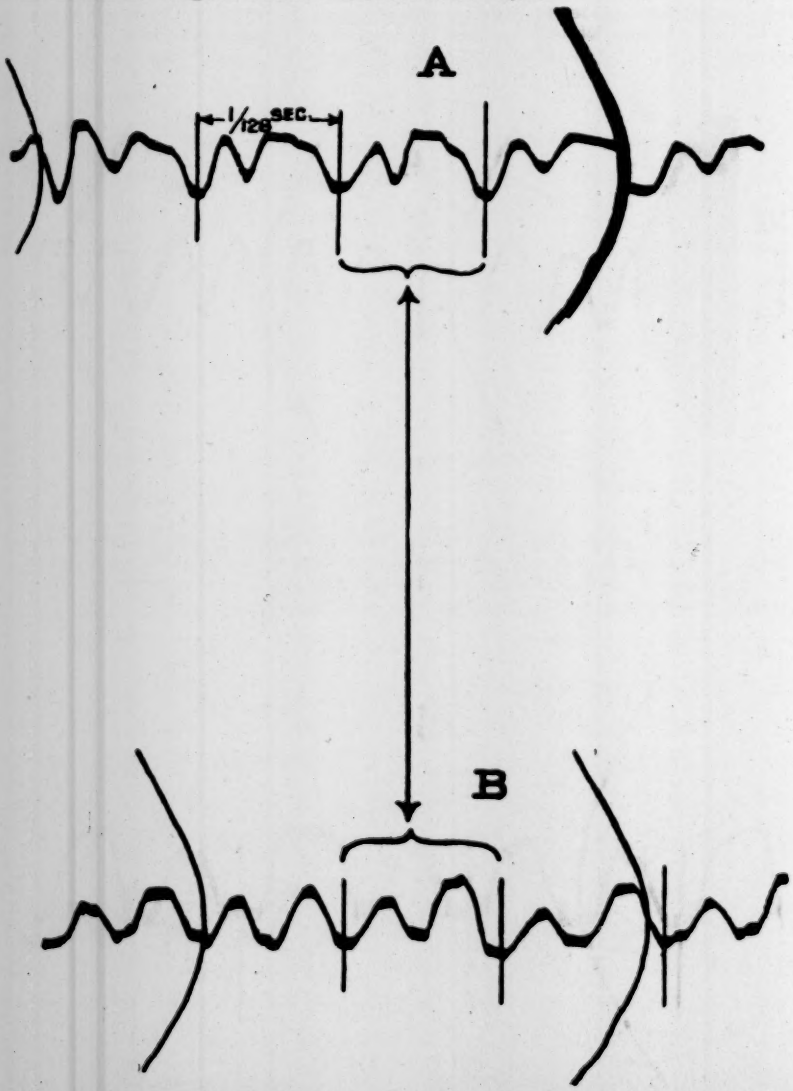


FIGURE FIFTEEN (Above) FIGURE SIXTEEN (Below)

PLATE TEN

Five vibrations of the natural larynx as compared with five others from the artificial larynx. (This photograph from the artificial larynx was taken some weeks after the pictures presented in the preceding plates, showing the effect of the deterioration of the rubber on its elasticity. The two series here presented are photographed to slightly different scales.) A= Natural. B= Artificial. A represents the sound [i], as in see.

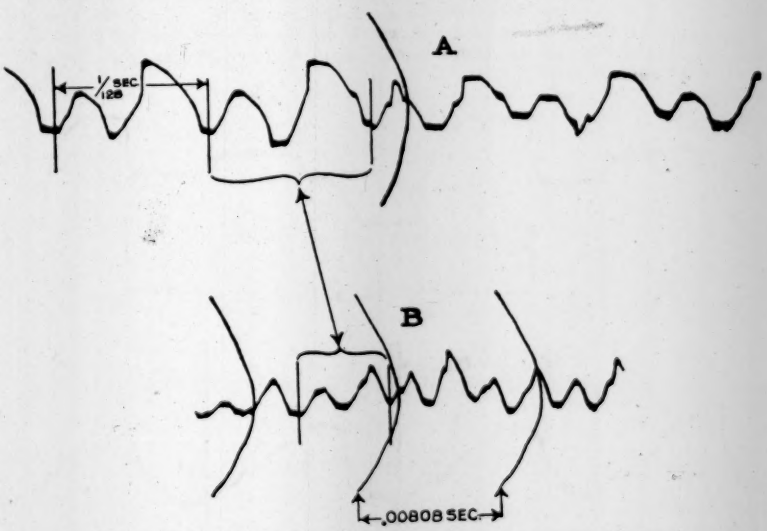


FIGURE EIGHTEEN (Above) FIGURE SEVENTEEN (Below)

PLATE ELEVEN

Photographs to demonstrate that the characteristic laryngeal curves shown in the preceding plates owe their shape to the peculiar movements of the larynx and not to any tendency of the apparatus to cause all vibrations to record themselves in that form. The curves on this and succeeding plates are tracings made from the voice itself transmitted through the standard microphone of the magnetophonograph. Note the variety of shapes. The curves on this plate are of the sound of [n], as in noon. A was made at the same time as curve A on Plate Nine, and is a curve from the same voice at the same pitch. B is a curve of the same sound by another voice.

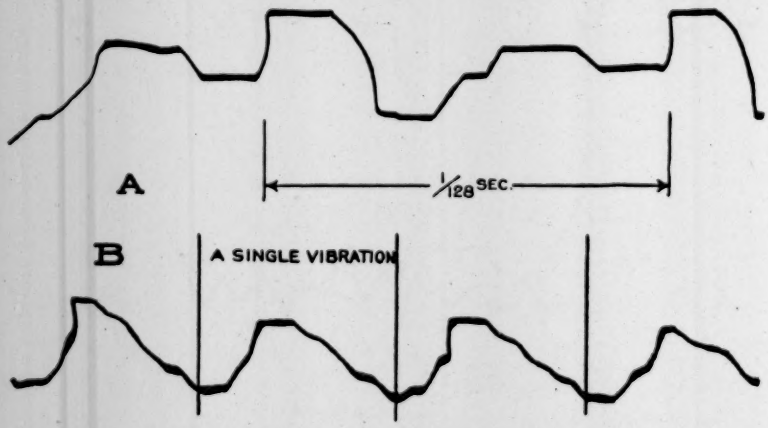


FIGURE TWENTY (Above) FIGURE NINETEEN (Below)

PLATE TWELVE

Magnetophonophotographs of: A, the vocal sound [1], as in lamb, and B, [i] as in see, which is the same sound that furnished the basis for the larynx curve A on Plate Ten. It should be noticed in this curve B that the shape is almost completely single. As the pitch is high, this is what one would expect, to be in conformity with the principle illustrated on plate Fifteen.

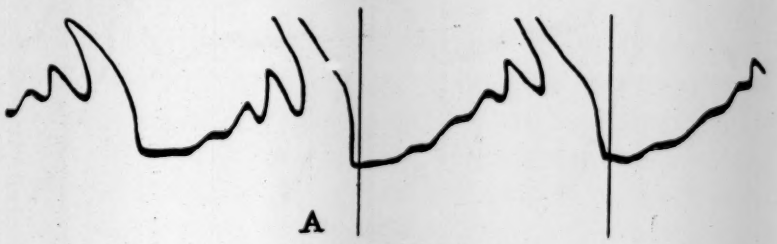


FIGURE TWENTY-TWO

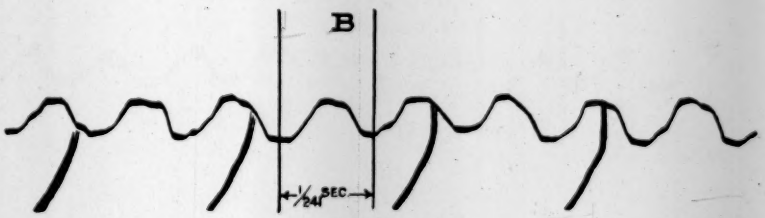


FIGURE TWENTY-ONE

PLATE THIRTEEN

Magnetophonophotographic Studies. A is of the vowel [i]. Note the time lines checking the record in .0166 seconds.

B is a test of the magnetophonophotograph as to its accuracy. It shows the vibrations of a tuning fork. Note the almost sinusoidal form of the curve.

C is a test of the apparatus as to its responsiveness to rapid vibrations. It is the picture of the vibration of a violin string, frequency about 995. Thus each individual point on the curve represents a fraction of a second as small as 1/6000 or 1/8000.

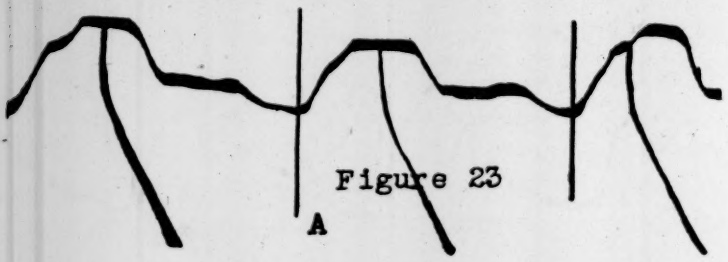
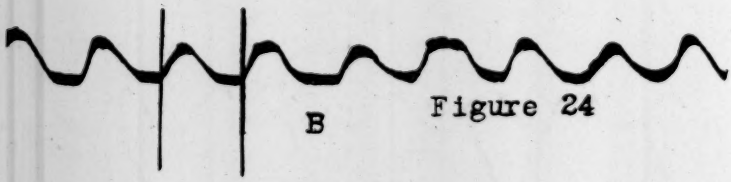


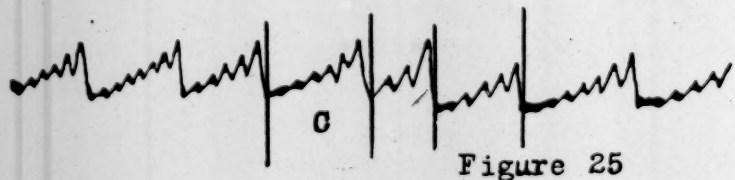
Figure 23

A



B

Figure 24



C

Figure 25

PLATE FOURTEEN

THE KOENIG MANOMETRIC FLAME AND REVOLVING MIRRORS

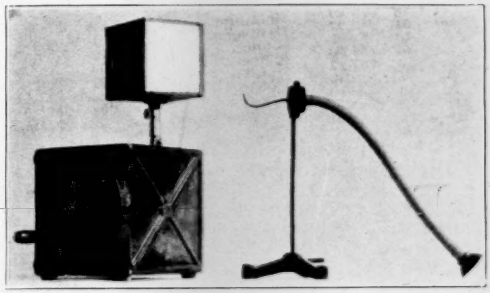


FIGURE TWENTY-SIX

SCHEMA TO ILLUSTRATE CAPSULE DETAILS

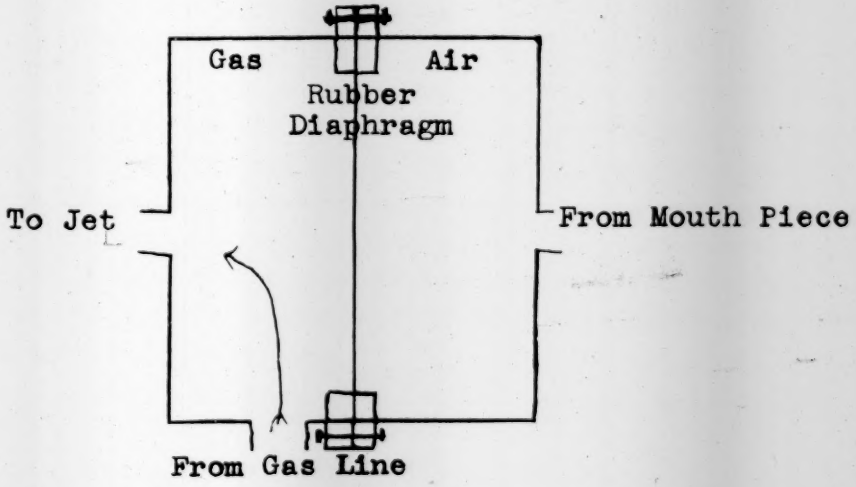


Figure 27.

PLATE FIFTEEN—FIGURE TWENTY-EIGHT

Drawing of the curve of a man's voice as shown in the Koenig experiment with the manometric flame an dmirrors. Mirrors turned at the same rate in both curves.

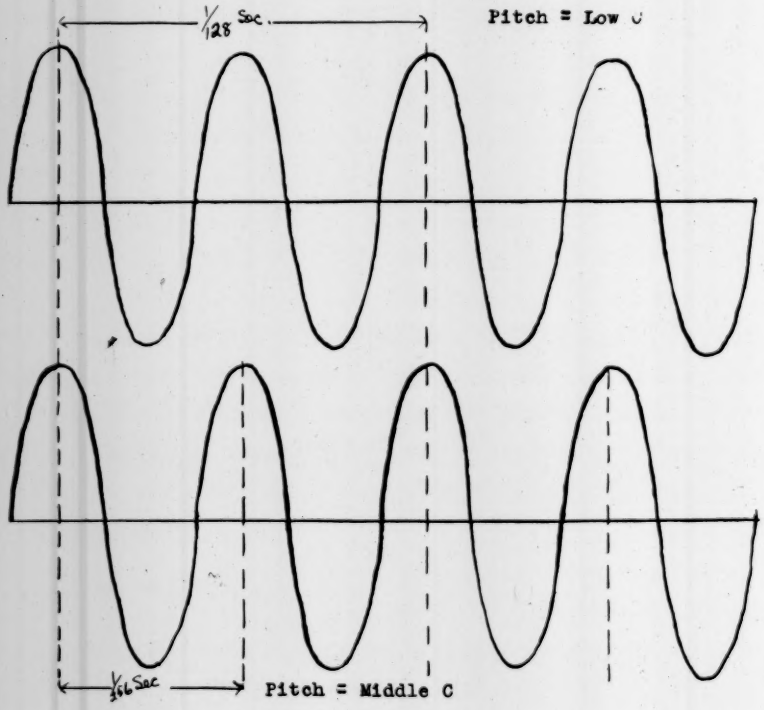
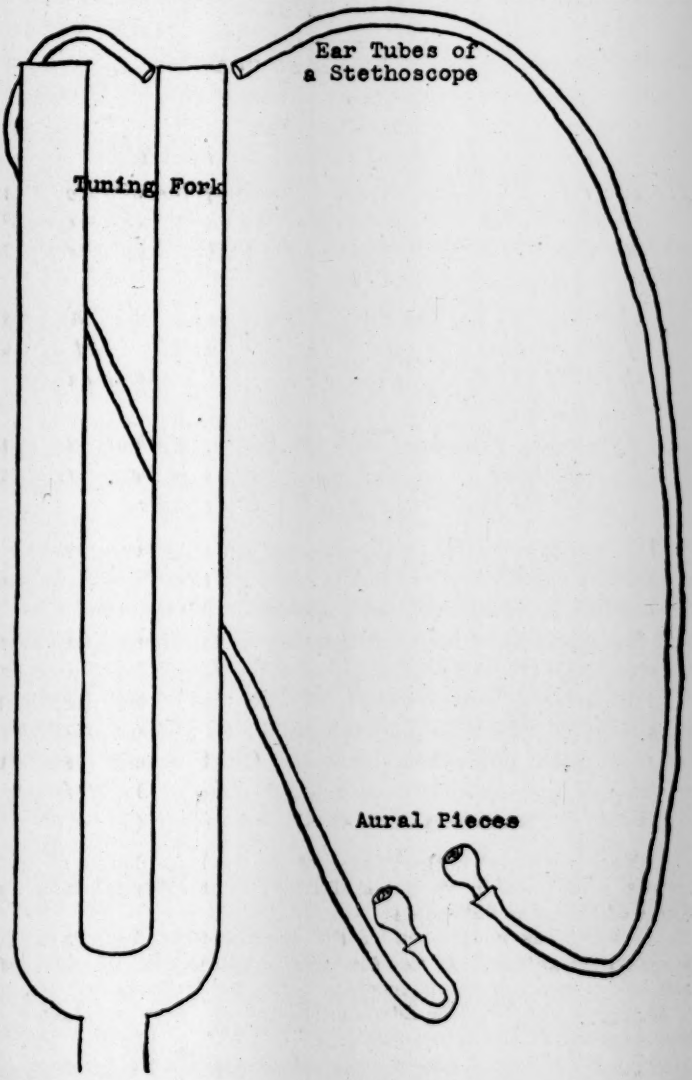


PLATE SIXTEEN—FIGURE TWENTY-NINE

BINAURAL EXPERIMENT WITH TONES OPPOSITE IN PHASE



AN EXPERIMENTAL STUDY OF THE VIBRATO IN SPEECH*

GILES WILKESON GRAY
University of Iowa

Introduction: Historical survey; the vibrato.

I. *Theoretical Considerations: Criteria of the vibrato; Possible reasons for the non-existence of the vibrato in speech; Possible reasons for the existence of the vibrato in speech; Types of fluctuations.*

II. *Characteristics of the Pitch Vibrato in speech: The presence of the vibrato; The rate of the vibrato; The effect of change of pitch; The range of the vibrato; Pitch and intensity.*

III. *Conclusions.*

Appendix: Technique and procedure; Method and apparatus; Methods of reading film; Errors in reading; Plotting graphs; Preliminary steps; Final procedure.

INTRODUCTION—Up to the present time no research has been undertaken specifically on the subject of the vibrato in speech. The studies in vocal arts, both speech and song, that have been thus far made have been, in general, along three lines more or less separate: (1) the perfection of a technique for the recording and measuring of sound waves; (2) the use of this technique in the study of inflections and intonation in speech; and (3) the study of pitch and rythm in song. Chief among these studies are those of *Scripture* (10)[1], *Merry* (6), *Schoen* (9), *Herzberg* (1), *Kwalwasser* (2), *Metfessel* (3, 4, 5) and *Simon* (11).

*A Thesis presented to the Faculty of the Graduate College of the State University of Iowa, in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy.

This work was undertaken at the suggestion of Dean Carl E. Seashore, whose guidance in the furtherance of the research has been invaluable. I am also deeply indebted to Professor Ruckmick, Dr. Milton F. Metfessel and Dr. Lee Edward Travis, who have been generous in their suggestions and criticisms.

[1]Numbers following names refer to the numerical sequence in the Bibliography.

The last four investigators mentioned used optical levers, such as the phonelescope, recording the sound waves on a motion picture film. This technique was perfected by *Metfessel* (4), and has been used in this research. The method of reading the films thus exposed was developed by *Herzberg* (1) and *Simon* (11).

In the study of inflections in speech, besides the work of Scripture[2] on intonation (10), two investigations have been made at the University of Iowa: the first by *Merry* (6), and the second by *Metfessel* (3). In neither of these, however, is mention made of a possible vibrato in speech, the interest being centered mainly on the larger pitch fluctuations known as inflection and intonation. *Merry* studied several selections, chiefly E. H. Sothern's reading of Shylock's Defense, from "The Merchant of Venice," as recorded by the Victor Company, No. 7463. *Metfessel's* work was on an address by W. J. Bryan, "Immortality," from "The Prince of Peace," Victor Record, No. 16168-B.

The vibrato in song, which has been under subjective observation for many years, was first objectively studied and measured by *Schoen* (9), who has been followed by *Herzberg* (1), *Kwalwasser* (2) and *Metfessel* (5). A synthesis of the findings of these various investigators, presented under the caption, "Criteria of the Vibrato," has been accepted as the standard with which to compare similar variations in speech.

The vibrato. In the tones of trained singers especially, and to some extent in those of untrained singers, rhythmic pulsations can be heard. These pulsations made up of periodic fluctuations in pitch and intensity occurring at a rate of from about 5 to 9 per second, constitute what is called the *vibrato.*

Writers on singing and on the training of the voice have differed in their evaluation of these pulsations (9). But the investigations mentioned above have established the fact that they are a characteristic of artistic singing; that without their presence the tones are flat and dull. "The voice that possesses the most constant vibrato, constant in its presence in the tones throughout the range of the singer's voice, and of an amplitude and an intensity not obtrusive to the ear, but of sufficient intensity to be

[2]Among those who have worked on intonation may be mentioned *Calzia, D. Jones, Rosset, Rousselot, Klinghardt, Peters, Palmer, Morris, Weaver* and others. None of these, however, has worked on the same problem, or used the same technique as in this study.

easily audible, has the best effect on the hearer, provided the other factors that enter into artistic singing are present." (9)

This conclusion has been verified after a systematic study of several thousand tones, as produced by scores of singers, both trained and untrained.

The variations which constitute the vibrato are not produced voluntarily. On the contrary, many singers have been quite unaware of their presence. The vibrato is not, peculiarly, the result of training which is directed toward the production of this effect, but seems rather to be the result of training which is directed toward the production of a smooth tone. To a certain degree, it may be said that the vibrato is a by-product of training, yet a by-product which is always present, and which contributes no small part to the effectiveness of the artistic singing voice.

However, it is possible to produce fluctuations voluntarily which resemble, to a certain extent, those of the vibrato. Because of the strong effect produced by the involuntary pulsations (the vibrato), many singers, we are told (9), strive to simulate them. The result is likely to be an exaggeration of the pitch and intensity variations.

The position taken here will be that the difference between the vibrato and the tremolo is this difference just pointed out; namely, that whereas the vibrato consists of involuntary, the tremolo consists of voluntary, fluctuations. Those variations in pitch and intensity which are the result of conscious effort, or which have been developed as a habit, from once having been consciously, voluntarily produced, constitute, according to this interpretation, the tremolo; those which are produced, or which have been acquired or developed unconsciously, involuntarily, constitute the vibrato.

The general characteristics of the vibrato have been determined, so far as they apply to singing. They are discussed in detail in the next section. When the variations in pitch and intensity are plotted, the results are similar to those illustrated in Fig. 1. In this illustration, vertical divisions represent semitones, and horizontal distances tenths of a second. Figures at the extreme left in each graph represent pitch in terms of vibrations, and those immediately preceding the graphs represent intensity in millimeters.

In graph No. 1 in this figure, for example, the pitch of the tone to be sung was C-512. Instead of remaining steadily on this pitch, however, the tone fluctuates between 495 and 535, a range of about one semitone. In the 0.7 second here pictured, four such pulsations occur, giving a vibrato with a rate of about 6 per second. At the same time, the intensity, indicated by the dotted line, fluctuates synchronously with the pitch variations. That is, for each rise in pitch there is a corresponding increase in intensity, and for each fall in pitch there is a corresponding decrease in intensity.

The figure shows various rates and ranges of the vibrato. In No. 8, for instance, is shown a rate of 7 per second, and a range of less than one semitone, while in No. 15 is illustrated a rate of 8 per second, and a range of considerably more than a semitone. In No. 14 the range is about one fourth of a tone, while in No. 20 it is about three quarters of a tone.

In Fig. 2 is shown the pitch vibrato in consecutive tones, in the singing of "Annie Laurie," by John McCormack. In this illustration the vertical divisions represent semitones, the horizontal divisions .18 second. According to this graph, the tones of this singer fluctuate in pitch about a quarter of a tone above and below the pitch on which the note is supposed to be sung. The first note, for example, sung on G-192, varies from a quarter of a tone below to a quarter of a tone above this pitch. In the .72 sec. taken in the singing of this note, there are five pulsations, giving a rate of about 7 per second. In the third tone ("wel") eight pulsations occur in 1.35 sec., giving a rate of about 6 per second.

These are typical illustrations of the vibrato. They show graphically how the pitch and the intensity fluctuate regularly in singing. It has been the purpose of the present study to apply the criteria of the vibrato in singing, as they are described in the next section, to speech. The questions to be answered are:

1. Does the vibrato occur in speech?
2. If so, what are its characteristics?

For the sake of continuity, technique and procedure are omitted at this point. They are described in the appendix, pages 52-67.

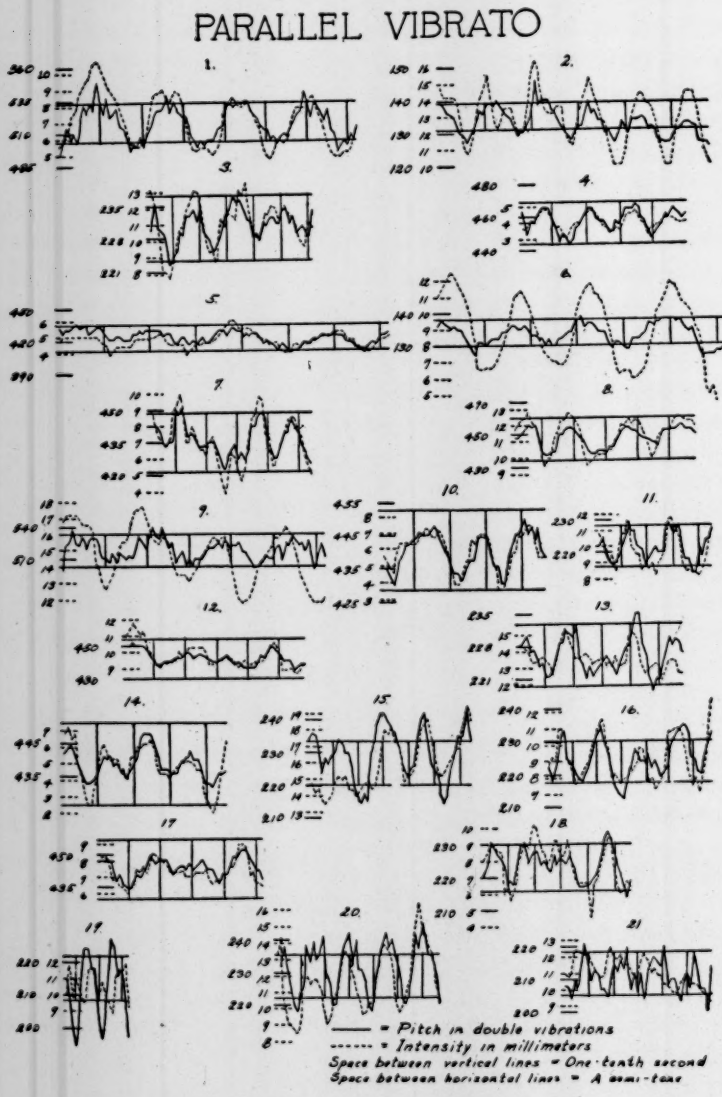
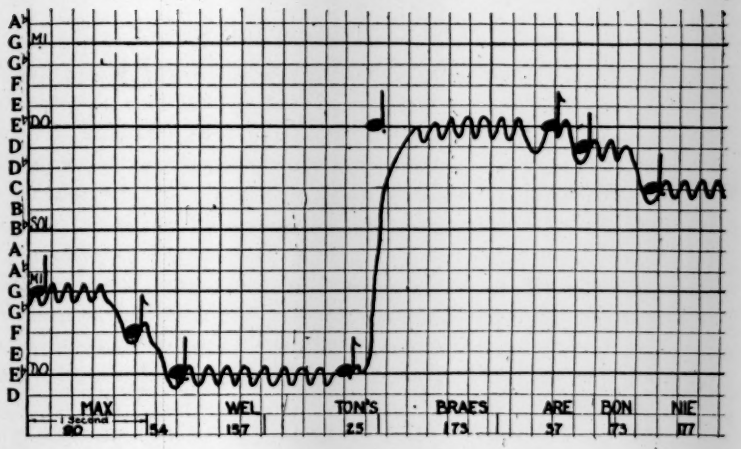


FIG. I (From Kwalwasser)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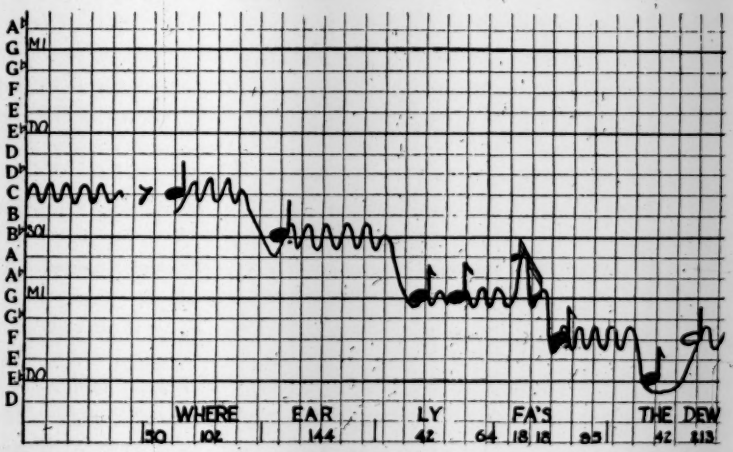
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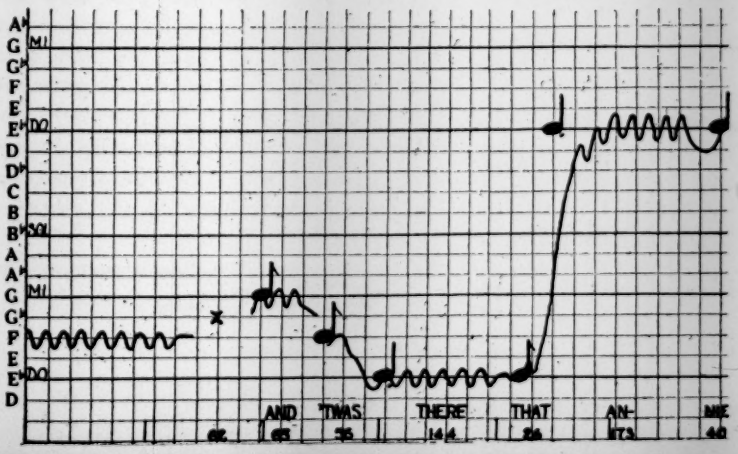
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1. *Theoretical Considerations*

Criteria of the vibrato.—According to the researches of *Schoen, Herzberg, Kwalwasser* and *Metfessel,* the vibrato is a periodic fluctuation in pitch and intensity from the prevailing mode, whether that mode be a sustained one, or a tone of progressively changing pitch and intensity.

The rate of fluctuation varies in singing from about 5.5 to 8 per second, with an average of about 6, according to *Schoen* (9). There is some difference of opinion on this score, however, *Herzberg* having found an average rate of 7.4, ranging from 6.5 to 8.3 (1). There are individual differences, and under certain conditions not as yet fully known, individuals themselves will differ from time to time. These conditions probably include intensity or loudness, pitch, general physical condition of the vocalist, emotional context, and other factors.

For the present study it has been deemed best to include in the vibrato any pulsations having a rate of from about 5 to 9 per second. Any more or less periodic fluctuations, then, coming generally within this range, will be considered as conforming to this criterion of the vibrato.

There is also some difference of opinion regarding the extent of the vibrato. *Schoen* (9) found that it covers a range of about one-fifth of a tone, usually less. *Metfessel,* however, found (5) a greater range than this; according to his work, it extends to as much as a whole tone, and even more. The range may vary within a single tone. *Schoen* also found that the range, in terms of vibrations, was about the same regardless of pitch; that is, it is about 10, 11, and 12 d. v. for the lowest, middle and highest ranges respectively, or 0.25, 0.15, and 0.09 in terms of a part of a whole tone. But *Metfessel,* whose work may perhaps be considered the latest word at the present time, found that the extent is approximately a function of the frequency. In other words, a higher pitch will have a relatively greater extent of vibrato, in terms of percent of a tone, the variations in the actual number of vibrations increasing considerably. According to his work, a rise in pitch of one octave will result in an increase in the range of the vibrato of about one-fifth of a tone.

For the purpose of the present study, it has been considered advisable to include in the vibrato any fluctuation which is evi-

dently a rise and fall of pitch over a period determined by the rate. It does not seem advisable to limit the range more than it is limited in singing.

The vibrato tends to disappear with rapid changes in pitch. It may be present before and after such a change, if the tone is then sustained, or if the rapidity of the change is decreased.

The weight of evidence has been in support of the theory that the pitch and intensity changes are synchronous and coordinate. This is in accordance with the findings of *Schoen* (9) and in general with those of *Metfessel.* According to this theory, a rise in pitch in the vibrato is accomplished by an increase in intensity, and a fall in pitch by a decrease in intensity. *Kwalwasser* disagrees with this conclusion, however (2), as does *Herzberg* also. (1) *Kwalwasser* points out that in the tones studied in his work, 12% of those possessing the vibrato have the "opposite vibrato," and exhibits graphs in support of his point. *Herzberg's* photographs also seem to bear out this point of view, viz that a decrease in pitch in a vibrato may sometimes be accompanied by an increase in intensity, and a rise in pitch by a decrease in intensity.

But *Metfessel* has found only one case in which there is such an oppposite relation. He estimates that in probably 99% of the cases the principle of coordination holds true (5).

The findings of *Herzberg* and *Kwalwasser* were based on judgments of amplitude of the wave form on the film. But one must take into account, as *Kwalwasser* did to some degree, the fact that the membrane of the phonelescope has natural periods of its own which affect the amplitude for the different frequencies of the sound. The testing of a membrane is a long and intricate process, as described by *Miller,* for which equipment is not available. (7:142 f)

In sum, due to Metfessel's advanced studies of the vibrato in song, the conclusion is warranted that his estimate is not far from right, as regards singing; namely, that in the great majority of cases the pitch and intensity changes in a vibrato are both synchronous and co-ordinate.

The *essential criteria* of the vibrato, then, are (1) periodicity of fluctuation in pitch *or* intensity, or in pitch *and* intensity; (2) a rate of fluctuation of from approximately 5 to 9 pulsations per second; (3) an extent in variation in pitch of from zero to one

full tone or more, and (4) usually a synchronization and co-ordination of pitch and intensity variations. Exaggerations in (2) and (3) constitute, according to *Metfessel,* the *tremolo* (5).

In the study of the speech curves in the present work these fundamental factors have been constantly in the foreground. Variations in vibrato are variations in one or more of these essential criteria.

Possible Reasons for the Non-Existence of the Vibrato in Speech.—Stumpf points out that "Beim Sprechen benützen wir ausser sprunghaften fortwährend stetige Tonveränderungen, beim Singen—principiell wenigstens—nur Sprunghafte." (12)

The vibrato in singing occurs mainly on tones that are held on the same pitch for an appreciable length of time. Speech tones are rarely held, even on approximate pitch, for as much as .9 sec. In *Merry's* study (6), the first ten words have respective durations of .19 sec., 0.04, 0.46 (disyllabic), 0.48, 0.18, 0.51 (disyllabic), 0.15, 0.15, 0.09, 0.81 sec. The last word is disyllabic: "million;" the first syllable is 0.48 sec., followed by a silence period of 0.27 sec., then the last syllable of 0.33 sec. Some records were obtained in which the analyzable tone lasted for as much as 0.9 sec., but they were rare, the majority of tones being, in conversational speech, held for a much shorter period than this.

Holding a tone on a definite pitch is another characteristic of singing. "Eben weil feste Intervalle nötig sind, sind auch feste Töne nötig." (12) This necessitates rigidity of the musculature, which, according to *Schoen* (9), causes the tremors in the tone. It is, he says, because singing is essentially an emotional act that the "vocal muscle (*sic*), under tension, brought about as a result of the emotional excitement involved in singing, responds with a rhythm of muscular discharge at a rate half of that found in the normal state, and that this tremor is manifested particularly in that organ which is functionally connected with the vocal emotional expression, the larynx."

In speech, on the other hand, there is no need for such holding of a given pitch, nor for the holding of any pitch for a given time. Muscular rigidity is not a characteristic of speech, and the conditions that produce the tetanus are not present. "Man kann experimentell beobachten, wie die sonst leicht erkennbare individuelle Eigenart des Sprechens (abgesehen von gröberen Klangfarben-

unterschied) verschwindet, sobald ein bestimmter Ton festgehalten wird." (12)

Not only is there no need for holding the tone on any given pitch in speech, but the definite changes that are characteristic of singing do not take place in speech. Definite intervals do not form the basis of pitch changes in speech glides. In singing, pitch changes are made as between stationary points, with the glide itself as more or less submerged; it is these points of rest that stand out. In order for the singing to be accurate, it is necessary that at these points the musculature assume, even if only momentarily, the rigidity that is needed for a tone held for a longer period.

These definite changes do not take place in speech. "Singen ist gebundene, Sprechen freie Tongebung" (12). There are no such points of rest as singing, no stationary moments: the pitch is constantly changing. Furthermore, the tone on any intermediate pitch in a succession of pitches is just as prominent as at any other pitch, except for general changes in loudness or intensity. It is the glide itself that is outstanding, rather than a series of definite tones. Hence there is not the muscular rigidity in speech that there is in singing, even in pitch change.

Training in speech does not ordinarily involve training in the holding of definite tones. As a matter of fact, voices are not as a rule trained for speech as they are for song. Such training (for speech) involves such matters as quality (resonance), intensity (or loudness and volume), rate (including variation in length of vowels, and pausing), and pitch (including ability to control *changes* of pitch rather than ability to hold a definite tone). It is a well-known fact that good singers are not necessarily good speakers, in the sense that they have good speaking voices, nor are good speakers always good singers. Training for the one does not provide training for the other. Consequently, there is not as a result of speech training a development of those factors which produce the vibrato.

Possible Reasons for the Existence of the Vibrato in Speech.— Even though, in conversational speech, tones are seldom held for an appreciable length of time, in the expression of certain moods and emotions there seems to be a lengthening of the time element so that there is opportunity for the vibrato to creep in. Even at the slow rate of 5 per second, no more than 0.40 sec. would be neces-

sary for two pulsations to appear, and at the fast rate of 9 per second, 0.22 is ample, if the vibrato is present at all. Of the thirteen syllables mentioned above from *Merry's* study, three, or 22%, are long enough to contain at least two pulsations.

The operation of the nervous impulses in the tones held on a definite pitch may not be totally different from those in tones held on an approximate pitch, although it may not be exactly the same. *Metfessel* has shown (5) that there is a tendency for the vibrato to disappear with rapid changes of pitch; but not all such changes, in speech, are so rapid that the vibrato is eliminated. *Herzberg* showed that the vibrato is present in the portamento as well as in tones of constant pitch (1). While many of the pitch changes in speech are quite rapid, there are, on the other hand, also many that are so slow as to come within the rate of a portamento.

Furthermore, the emotional aspect of vocalization is not confined to singing. Because of its neurological connections with the viscera, through the tenth cranial nerve, which is directly concerned in emotional reactions,[1] the musculature of the larynx is affected in all its activities by emotional disturbances, as are also the respiratory and the articulatory apparatus. If, then, such emotional reactions tend to produce in singing the tremors mentioned by *Schoen*, there is no physiological or neurological reason why they should not also produce them in speech.

Rigidity is a relative term, as applied to muscular movement or position. "Ein stetiger Übergang oder eine Ton-Bewegung im prägnanten Wortsinn ist nicht eine Summe aufeinanderfolgender Töne .... sondern eine einheitlich, qualitätiv eigenartige Tonerscheinung, so einheitlich wie ein festliegender Ton." (12) This movement may in fact exhibit a certain degree of "rigidity" in emotional stress, in which case one might expect a tremor to appear in the tone.

"When the nervous and muscular systems are tasked to their utmost, in the expression of sentiment or passion, the voice is characterized by a tremulous tone. This tone is familiar to everyone from the exhibitions of it which so often occur in common life, when persons are actuated by strong feelings of joy or grief, hope or fear, anger or tender sympathy, and by some others of the most common emotions.

"In dramatic elocution, the tremor is of frequent occurrence. It may be required in farce, or in comedy, and produces some of the most power-

[1]Prentiss, Dr. H. J.: Lectures on Voice Anatomy, 1925.

ful effects in tragedy. But in oratory, it is rarely indulged in, and need not be cultivated. It is well, however, for a student of elocution to be aware of its existence as a natural exponent of emotion, and sometimes to indulge himself, to a moderate degree, in its use. When cultivating the utmost depth and earnestness of expression; when his emotion gives him a sensation of speaking from the lowest depths of his breast, and produces a convulsive action of that part of his frame, he will find his voice naturally incline to a tremor on the most passionate words. A slight degree of this tremulous tone may sometimes be indulged in, to increase his expressiveness.

"If, however, he deliberately makes use of the tremor, so that the hearers are led to notice the fact of his doing so, the effect will be undesirable in any delivery which he intends to be useful.

"A decided tremor results, in fact, from bodily weakness, when the speaker is under the influence of overmastering feeling. Any considerable manifestation of weakness is injurious to oratory. The hearers commiserate the speaker, instead of yielding to his influence. The tremor, like the semitone, is very easy to execute by those who cultivate an affectation of emotion, instead of genuine eloquence, and is therefore liable to be resorted to, by those who practise what may be called *tricks* in delivery." (8:397f)

Fluctuations appear in the untrained voice as well as in the trained. *Simon* concludes (11) that "trained voices are distinguished from the untrained mainly by the greater periodicity of their fluctuations, even in unemotional tones, and also by their greater uniformity to each other and to their standard of a constant tone." The effect of the training is not to produce the fluctuations, then, but to reduce them to a periodicity.

Furthermore, as *Schoen* and *Kwalwasser* indicate (9, 2), the vibrato is present in the tones of both trained and untrained voices. If the conditions are present, emotional and otherwise, that produce the vibrato in the one case (singing) in untrained voices, there is no reason why they should not produce them in the other case (speech) with equally untrained voices.

Since speech is more variable than song, one may, theoretically, expect the vibrato, if present, to be more variable. Since training tends to smoothe out the pulsations, and lack of training tends to leave them in a somewhat cruder state, one may expect them, if present, to exhibit probably something of the crudity of the untrained voice. Since training tends to smoothe out the fluctuations in general, and reduce them to a periodicity, so that untrained voices show a lower percentage of the vibrato, one may, theoreti-

cally, expect speech to contain less vibrato than does the trained voice in singing. Since general pitch variations are frequently more rapid in speech than they are in singing, one may expect on this account a considerably less amount of the vibrato.

To sum up, then, while there are evident reasons why one need not expect the vibrato in speech to assume all the regularity, and all the smoothness, nor to be present to the extent to which it is present in singing, on the other hand, there are equally cogent reasons why one may expect to find in speech some traces of the vibrato, conforming in the essential characteristics to the vibrato in singing.

Types of fluctuations.—Another question that presents itself is, What type of fluctuation shall be considered in determining whether the vibrato is present? In this study an attempt has been made to include in the calculations only the verifiable cases. These fall into several classes.

In the first place, there is the typical fluctuation, determined easily by inspection. The three major fluctuations occurring in Fig. 3 are illustrations of this type. In Fig. 4 are also fluctuations which fall within this class.

In the second place, there is what may be called the "drift."[1] This is a not uncommon type of fluctuation in speech, occurring only in inflections, either rising or falling, when the general mode upward or downward is interrupted for a time by a leveling off of the pitch, for a period of perhaps .07 sec. more or less, followed by a resumption of general mode. An example of this type is shown in Fig. 7.

The peculiarity of the "drift" lies in the fact that it consists, not of an actual rise and fall in pitch, as is the case in the usual vibrato pulsation, but of a momentary level of pitch, with perhaps minor fluctuations, for a duration comparable to about one-half of the period of one cycle of the vibrato. In a falling inflection the leveling off corresponds to what would be a rise in a vibrato on a sustained tone; in a rising inflection it corresponds to a fall in such a vibrato.

This breaking into the general mode of the pitch change, if it

[1]The appearance of the "drift" when plotted is comparable to the well-known "plateau" which occurs frequently in learning curves. The term "drift" conveys a sense of progression, but practically at a level.

occurs periodically, or if it occurs in a periodic series of fluctuations, constitutes a vibrato as truly as does the periodic rise and fall in the case of a sustained tone.

In a vibrato having a rate of 8 per second, each complete cycle has a duration of 0.125 sec. A "drift" of 0.06 sec. would, therefore, constitute one-half of such a pulsation, and could be considered as conforming in this regard to the essential criteria. For a rate of 6 per second, each cycle having a period of 0.17 sec., a "drift" of 0.08 or 0.09 sec. duration could be so considered.

The "drift" occurs not only in tones of rapidly changing pitch, but also in those of quite slow change. At the beginning of the ninth "block" in Fig. 12 is an illustration of this latter type.

It is not necessary that the "drift" be a perfect leveling off; that is, the pitch need not be held without variation for any time. Minor fluctuations may enter in, as may be seen in the first "block" in Fig. 8. When these are smoothed according to accepted principles, the result is a "drift."

The value of such fluctuation, as compared to the norm (a vibrato on a sustained tone), may be determined in the following manner (Fig. 37); Assume the broken line (Fig. 37b) *ABCD* to represent the total change of pitch, plotted from the raw readings. Join the midlde points of each of the three legs, making the line *abc*. On the abscissa *A' D'* erect perpendiculars above and below, respectively, equal to the vertical distances from line *ABCD* to the line *abc*, and connect the ends of these perpendiculars in the curve *a' B' b' C' c'* (Fig. 37c). This will give approximately the equivalent of the fluctuation in the original graph.

The theory is this: Assuming the line *abc* to represent the general mode, any point on the line *ABCD* will represent the amount of variation from that mode at any given time, the time values being represented on the abscissas. Thus, the perpendicular distance *Bd* represents approximately one semitone; in other words, the point *B* represents a pitch one semitone above the general mode at that instant of time. Similarly, the point *C* represents a tone approximately three-quarters of a tone below the general mode at that instant. Other points are figured in the same way. The result is shown in Fig. 37a.

This is, of course, an approximation. Frequently it is impossible to determine exactly a midpoint through which to run a line

indicating the general mode. The resulting graph is not intended as an accurate representation of the pitch fluctuations, but simply as a visual method of comparing the fluctuation that does occur at any point with one occurring on a sustained tone, when the sustained tone is the norm. It is a convenient method of analyzing such a fluctuation, to find out in a general way how closely it approaches to an actual vibrato pulsation.

The third type of fluctuation is the obscure, the kind that requires a certain amount of smoothing in order to determine the variation. It may be said that it is only by the process of smoothing that these variations finally come to light as definite vibrato.

This is done by averaging the fluctuations that occur, and noting the appearance of the corrected curve. For example, in Fig. 12, at the end of the ninth "block," of .18 sec., two peaks occur close together, with a small valley between. If these values involved are averaged, we find a point near the upper limit, near the frequency of 188 d. v. By following this method through the variations at this point, we find a fluctuation that resembles, when corrected, the typical vibrato. Hence this has been included in the calculations.

On the whole, it may be said that in case of considerable doubt as to whether a given fluctuation could, by such process of smoothing, be called a vibrato, the difficulty was resolved by throwing the case out altogether. The attempt has been made to keep the errors, where they occurred, errors of conservatism. A minimum of these obscure cases has been included in the present study. In no case has a vibrato been adjudged present on the basis of a single fluctuation in a time interval of .02 sec.

A fourth type of phenomenon that occurs is the "missing cog" type. In this, one or more of the internal pulsations are missing, apparently or actually. Occasionally a careful analysis will reveal the presence of a fluctuation of a very small range; at other times no amount of analysis will fill in the missing "cog."

This type is, on the whole, quite rare, only three instances having been found. Fig. 35 is an apparent example. There should be a pulsation at the eighth block. The absence of a great intensity fluctuation at that point indicates that possibly there is no pitch fluctuation that can be compared to the vibrato. But we have two apparent "drifts" at this point, very close together.

Analysis of the readings shows that although the second "drift" influences to a slight degree the actual pulsation here, it is not what may be called a significant reading, being only one group of .02 sec. The graph would, then, when smoothed, run over, with but a slight dip to the following pulsation.

This leaves the first "drift" to be accounted for. Analysis shows this to be a true "drift," making a very small pulsation at this point.

It should be noted that in this illustration pitch and intensity changes are both synchronous and co-ordinate, following the theory generally supported. In this case, both the amplitude and the mean breath pressure follow the pitch variations very closely, both as to rate and as to extent. A wide variation is accompanied by a wide intensity variation, and vice versa.

At the point just considered in this graph, the intensity undergoes a slight change, following the general order: a slight pitch change is accompanied by a slight intensity change. The correlation of these two factors bears out the conclusion that this "drift" constitutes an actual pulsation in the periodic series.

No theory is offered to explain a fluctuation of such a narrow range in the midst of a series of fluctuations of comparatively wide range.

Still another type of variation, which, although it cannot be classed as vibrato, must be taken into consideration, is the isolated type, where one big variation stands out alone, sometimes in a whole record of as much as one second duration. This type is most frequently found in the period immediately preceding or following a wide and rapid change of pitch. It may consist of a circumflex, an inverted circumflex, a double circumflex, or a double inverted circumflex. Fig. 10 illustrates the circumflex, characterized by the rise, followed by a fall in pitch. In Fig. 29, occurs a single, isolated wave, which would be classed as the double inverted. The general trend is downward; the pitch takes a sharp rise, followed by a continued fall. Fig. 26 shows the double circumflex, while in Fig. 33 occurs, in the tenth block, an inverted circumflex. This is one of the few instances of the isolated fluctuation occurring in the middle of a tone that is held on a fairly even pitch.

II. CHARACTERISTICS OF THE PITCH VIBRATO IN SPEECH

The Presence of the Vibrato.—Of the 23 subjects studied, 19, or 83%, show the presence of the vibrato in speech as described above. Of the 213 records made by these subjects, 74 or 35% show these pulsations.

These fluctuations occur in both sustained tones and in tones of changing pitch. In fact, the sustained pitch is the exception rather than the rule in speech, and the fluctuations that do occur are in the majority of cases on a changing pitch. Fig. 15 is a good illustration of such a fluctuation on a tone that is as near to a sustained pitch as occurs. Fig 11 is an example of the fluctuation occurring in a falling inflection, while Fig. 8 illustrates the rising pitch.

118 of the 213 records contain a definite falling inflection. Of these, 28, or 24%, show the periodic pitch fluctuations.

100 records contain a definite rising inflection. Of these, 15, or 15%, show periodic pulsations in pitch. Indications are, therefore, that the tendency to the vibrato is somewhat more pronounced in the falling than in the rising inflection.

It should be noted that, in proportion to the total time elapsing in speech, the amount of the time covered by these fluctuations is not so great as in song. *Metfessel* found (5) that in the singing of Welles, a trained professional singer, the amount of the vibrato was a little over 61% of the total time, including pauses, unanalyzable sounds, consonants, and rests. If the periods of analyzable tones only are included, the percentage is much higher, although the precise figures are not available. The total time covered by the 213 records in speech is 242 sec. The total time covered by the vibrato in these records is 55 sec., or 23%. Most of these speech records were of emotional speech. If non-emotional, conversational speech were to be included, the percentage would obviously fall much lower than the above figure. There is no way of determining exactly what the percentage would be, without recording the total speech of a number of subjects over a period of years.

Even in the records where the vibrato is present, the percent of time covered by the vibrato is probably much less than that found for singing. The 74 cases containing the vibrato have a total duration of 80 sec. The total time covered by the vibrato is 55 sec., or 69%. This includes, of course, only analyzable sounds.

In other words, in the utterance of a given vowel sound in emotional speech, there are periodic fluctuations in pitch covering, on an average, about 23% of the total time of the vowel sound. The rest of the record, 77%, is variable in pitch, without regularity or periodicity. Fig. 5 is a good illustration.

That these apparent fluctuations are not due to errors in reading is shown by a comparison of the graphs in Fig. 32. The film from which this graph was made was given three independent readings, in three different manners. In the first (a), the wave length was determined by checking the critical intersections of the wave form with the base line. In the second (b), wave lengths were found by taking the corresponding "jog" at the peaks or highest points of the wave forms. In the third (c), wave lengths were found by taking corresponding "jogs" in the valleys or lowest points of the wave forms. The three readings thus obtained for each group of .02 sec. were then averaged, and from these averages the fourth graph (d) was constructed. The essential similarity of the four is evident. Furthermore, it is equally evident that if the vibrato is present, it would take a greater error in reading than actually occurs to obliterate it from the graphs.

The absence of periodic fluctuations does not mean that there are no fluctuations at all. *Simon* has shown (11) that in singing as well as in the tones produced by various musical instruments, the presence of consecutive waves of the same length is the exception rather than the rule. In speaking, where there is less emphasis on the maintaining of a definite pitch, one might well expect, as a result, that there would be a considerable number of "free" variations, apparently governed by no laws or regularity. It may well be that herein lies one of the characteristic criteria of the speech tone; namely, the presence of the free variations in pitch, not describable under specific categories nor classifiable under special rubrics. "Singen ist gebundene, Sprechen freie Tongebung." (12) Fig. 5 shows also periodic fluctuations.

The position of these fluctuations in the progress of the sound is variable. Of the 74 cases, 12, or 16%, are at the beginning of the record. The same number, 12, are present neither at the beginning nor the end, but are found somewhere between. 33, or 45%, begin during the progress of the sound, and continue until the end, and 19, or 26%, continue throughout the record.

Fig. 17 illustrates the pulsations coming at the end. Fig. 3 is an example of their coming at the beginning. Fig. 22 illustrates the pulsations occurring well within the expression, and Fig. 14 shows them throughout the record.

In at least 12 of the 31 records included in the first and last classes, however, the sound begins before the reading. That is, in nine cases the beginning is lost because of having occurred before the film started, and in the other three, the first part of the record is unanalyzable because of low amplitude, or from some other cause. In these twelve cases, therefore, it is impossible to say whether the vibrato appears or does not appear at the first of the tone.

The predominance of the types where the pulsations appear after the expression is under way may indicate that it ordinarily takes some time for the vibrato to get started. The advantage is considerable, being 61% of the total, whereas 42% begin with the record. 52, or 70%, once begun, continue to the end of the reading.

There is to be noted a slight discrepancy when the percentages are added. There is a total of 103%. This is due to the fact that in two of the records the vibrato appears at the beginning and at the end, but does not appear in the middle. These are counted twice, making 76 total records.

That the vibrato occurs also in the speech of stutterers is indicated by the researches of *Travis*, whose work is to be published soon. Full details of this study are not as yet available.

The above data satisfy the first criterion of the vibrato; namely, that it is a more or less periodic fluctuation in pitch, whether the general mode of pitch be a sustained tone or a tone of changing pitch. The pitch vibrato, then, does occur in speech.

The Rate of the Vibrato.—The rate of fluctuation is highly variable. The range is from 4.4 to 10 per second, these being the extremes and are outside the limits found for singing. Nevertheless, they are true pulsations, and have as much of the regularity as have the cases which conform otherwise to this criterion. The average rate is about 6.4 per second. Fig. 25 is an example of a very slow rate, 4.4 per second, while Fig. 8 illustrates a very fast rate, 9 per second. Fig. 6 shows a rate of 7.1 per second.

The rate is not constant in all records. A slight ritard is shown in Fig 36, while Fig. 16 shows an accelerated rate.

Metfessel found (5) that in singing the rate of the vibrato varies periodically. It may be considered that the variations in the rate of the fluctuations in speech are due to their being taken at some particular phase of the cycle, although this is speculation.

Furthermore, the same mood is not always expressed, by different observers, by the same rates. Thus, *loneliness,* for example, shows rates of from 4.4 to 7.7 for seven observers, an average of 6.32. *Soothing* varies from 5.5 to 8.3 for 10 observers, an average of 6.6. *Awe* varies from 5.5 to 10 for 8 observers, an average of 7. For the 32 observations here listed the average is 6.575 per second.

The same individual does not express all moods at the same rate. *MFB,* for example, varies from 4.4 to 7; *MJH* from 5.5 to 7.4; *HB* from 5.5 to 7.1.

The rate seems to vary differently, for different observers, with the moods expressed. The following table will illustrate this:

TABLE I. *Comparative Rates of Different Observers for Different Moods*

	Soothing	Loneliness	Awe
MFB	6.1 (2)	4.4 (1)	7.0 (3)
HB	6.7 (2)	5.5 (1)	5.5 (1)
EAM	5.5 (1)	5.5 (1)	10.0 (2)
RH	6.8 (2)	7.2 (3)	6.0 (1)
MJH	7.4 (2)	6.9 (1)	7.4 (2)

This simply means that we do not as yet know the factors that enter into the variations, nor the extent to which they enter in. Loudness, pitch, and probably the physical condition of the observer at the time, may have an effect on the rate of the vibrato (5). The specific laws that govern them may well be the subject of further investigation.

Some significance may be attached to the fact that, according to the above table, *loneliness* is expressed in the slowest rate of vibrato, for four or five observers. The average rate for this mood, for seven observers, is the slowest of the three moods mentioned on the preceding page. This may be significant, but the number of cases is too small to warrant a definite statement.

The effect of Change of Pitch.—Of the 139 records in which periodic fluctuations pitch do not occur, many contain inflections involving wide and rapid changes. The tendency for the vibrato to disappear with the increase in extent and ripdity of the pitch change may account for its absence in many of the records. Figs. 27, 30, 31 are illustrations of its absence.

No specific data are available, as regards singing, with which to compare the point at which the vibrato tends to disappear in speech. The most rapid pitch change, in which the vibrato occurs, is a change of 21.5 semitones in 0.9 sec., an average change of .24 of a semitone, or .12 of a tone, in .01 sec. Four pulsations appear in this record (Fig. 25), giving it a rate of 4.4 per second. The next most rapid change is shown in Fig. 8, in which the pitch passes through a range of 15.5 semitones in .78 sec., an average change of .18 of a semitone, or .09 of a tone in .01 sec. In the first .54 sec. of this record are four pulsations, giving it a rate of 7.4 per second. Fig. 25 shows a falling inflection, while Fig. 8 shows a rising inflection.

These are, however, the only records in which such a rapid change of pitch is accompanied by the vibrato. In all others, either the change is much less rapid, or the periodicity does not appear until the change has become slower, or, as a third possibility, it does not appear at all. Fluctuations may and do appear occasionally, as in Fig. 29, but there is no evidence of characteristic periodicity.

In 28 such records there appears almost no fluctuation, except for an occasional instance of two consecutive groups having been read at the same pitch. This might be accounted for by error in reading. Figs. 30 and 31 illustrate the extreme cases, with Fig. 28 as typical. Fig. 3 shows how the vibrato usually disappears when the sharp rise is under way.

In this particular, then, speech compares with singing, and meets the criterion that rapid changes of pitch tend to cause the disappearance of the vibrato.

The Range of the Vibrato.—The range of the vibrato is variable. The variation in range is from the barely perceptible, less than one-fourth of a tone, to two full tones, and even more. Figs. 13 and 18 show the former while Fig. 9 shows an extreme range. The typical range at the medium pitch of the observer is about one semitone, varying somewhat above and below this amount, as shown in Figs. 3 and 15.

The range is not constant, either for different observers, or for the same individual. There is often a changing range within the same record. Figs. 9 and 32 illustrate this characteristic. They are both "crescendos," while Fig. 14 illustrates the "dimi-

nuendo." It may be noted that these are all three expressions of the same mood by three different observers. The first two represent the extreme range in the expression of *hate*, which calls for a tone, in these two cases at least, of considerable loudness. If *Metfessel's* definition of the tremolo is to be followed, (*vide ut supra*), these extreme ranges in variation may be considered as falling under this category.

Evidence is not lacking that loudness of tone both increases the range and reduces the rate of the vibrato, although the number of cases is too small to make a final statement.

There is no instance of the same observer giving both a distinct increase and a distinct decrease in range.

The pitch at which a sound is spoken apparently has little effect on the range of the fluctuation. As previously noted, *Metfessel* found that in singing, with a rise in pitch of one octave, there is an increase in the range of the vibrato. The evidence does not seem to support this conclusion as relates to speech. In Fig. 24, for example, many of the fluctuations at the higher pitch, both the periodic and the aperiodic, are more than twice the range of those at the lower pitch, in terms of tone. In terms of actual number of vibrations, of course, the difference is apparently more noticeable. This is an extreme case, however. Fig. 12 illustrates the gradually decreasing range as the pitch falls through an interval of about a second (in the diatonic scale).

On the other hand, in Fig. 4 the variations at the lower pitch are much greater than at the higher, as is also the case in Fig. 19. Among the records which do not show the vibrato, Figs. 21 is illustrative of the fact that the range of variations is about the same, in many cases, at the entire range of the usual speaking voice. A careful examination of *Merry's* graphs leads to the same conclusion.

It is not at all unlikely that herein lies another of the distinctive characteristics of the speech tone as distinguished from the singing tone: not only are there a large number of "free" variations in pitch, but there is also a freedom in the range of these variations, both periodic and aperiodic.

As compared with singing, then, the range of fluctuation in speech is somewhat more variable in that it covers a wider range, that it is less constant, and that the pitch apparently has little effect on it. The average, or the typical extent, however, compares

with that of singing in range, and thus far meets this criterion of the vibrato.

Pitch and Intensity.—As pointed out, the weight of what evidence has accumulated is, in general, in support of the theory that the characteristic vibrato is a pitch-intensity fluctuation, in which the variations in pitch and those in intensity are synchronous and co-ordinate. Due to the inadequacy, for the recording of intensity, of the optical levers available for this study, no final conclusions can be drawn as to the relation between pitch and intensity in the vibrato.

No attempt has been made, in this research, to base final conclusions on the amplitude of the waves as recorded on the film, mainly because of the uncertainty of the natural frequency of the membrane of the phonelescope. Certainly conclusions cannot be established on such a basis. In the 213 records made, a rise in pitch is very frequently accompanied by a decrease in amplitude of the wave *as recorded on the film.* This is not to say, however, that the actual intensity of the tone is indicated thereby, especially when the tone passes through a wide range of pitch.

It is evident, then, that amplitude alone, as recorded, is not to be depended upon for a determination of the intensity vibrato. Some additional evidence may be obtained from a measurement of the breath pressure at the mouth, which, however, must be distinguished from intensity. For this purpose the mask was used, and the fluctuations of the breath pressure as well as of the amplitude determined. This was done in the following manner:

The film was laid on the graph paper, with one edge coincident with one of the abscissas, and kept in this position by means of thumb tacks as it was moved along from right to left. The amplitude of the wave at each time interval (groups of .02 sec. were used) was marked off by means of a sharp awl, punching through the film and into the paper. The film was moved from right to left, so that a total time interval of .18 sec. was plotted in each square of the graph paper, each smaller interval of .02 sec. being allowed one-ninth of the space. This was repeated for the entire length of the record.

The points on the paper were then joined to form a double line, one representing the upper limit of the wave form and the other representing the lower limit. This double line, then, repre-

sented the fluctuations of the amplitude, while a third line, bisecting the distance between the two, represented the mean fluctuation due to breath pressure.

In Fig. 35 this procdure was followed. The two lines *A* and *B* show the amplitude of the waves as read in groups of .02 sec. The line *C* bisects the distance between *A* and *B* and represents the mean fluctuation of the breath pressure. In this case both the amplitude and the breath pressure follow closely the curve of the pitch, in accordance with the conclusions of *Schoen* and *Metfessel*. Fig. 36 is another illustration of the correlation between the two factors. This record is of a voluntary vibrato (tremolo) in which a definite attempt was made to sustain pitch as nearly as possible, varying only the intensity.

In Fig. 34, on the other hand, there is little relation between pitch and breath pressure. In this record the amplitude of the wave is practically constant, and the readings given in the graph were made with a selected "jog" on the wave, keeping to this jog all the way through. In other records (not shown) pitch, intensity and breath pressure show no apparent relation whatever.

There is a slight error in these graphs for intensity and breath pressure, due to the fact that it was not often possible to find a wave peak exactly at the critical intersection for the time interval. In such cases the nearest wave was taken, thus causing an error. But this amounted to not more than one half of each .01 sec., or .005 sec. This is one fourth of each time interval of .02 sec., or, on the graph, an error of 3%, which is imperceptible. It amounts to 1/36 of the distance between two adjacent ordinates.

In view of the data given, it is not possible to say definitely that fluctuations of intensity and breath pressure accompany fluctuations of pitch in all cases. Probably this is true in the great majority of cases. A more delicate acoustical apparatus is needed to determine accurately the relations existing among the three factors of intensity, breath pressure and pitch.

III. Conclusions

1. The vibrato occurs mainly in emotional speech, in 19 of 23 subjects. It is impossible at present to estimate its occurrence in conversational, non-emotional speech; it is probable that it is pres-

ent to a far less degree. It is present to a much less degree in speech than in singing.

2. The vibrato occurs in both sustained tones and inflections. The sustained tone is rare in speech. The vibrato tends to disappear in rapid changes of pitch.

3. There seems to be a greater tendency for the vibrato to appear in falling inflections than in rising. Sustained tones, where they occur, have most of all.

4. In tones of changing pitch, the fluctuation may assume the form of a 'drift,'' which can be compared to a fluctuation in a sustained tone.

5. The rate varies from 4.4 to 10 per second, these being the extremes. The average is probably close to 6.4 per second.

6. The extent of the fluctuation varies from less than one fourth of a tone to two full tones.

7. Individual differences among subjects are probably no greater than differences for any one individual, both for rate and for extent.

8. Irregularities in both rate and extent of the vibrato are in general, more prevalent in speech than in singing.

9. Pitch and intensity fluctuations do not seem always to be dependent one on the other. It is not always possible to plot the intensity pulsations, because they may be ''swallowed up'' in a general change which may and often is independent of any pitch change.

PLATE I

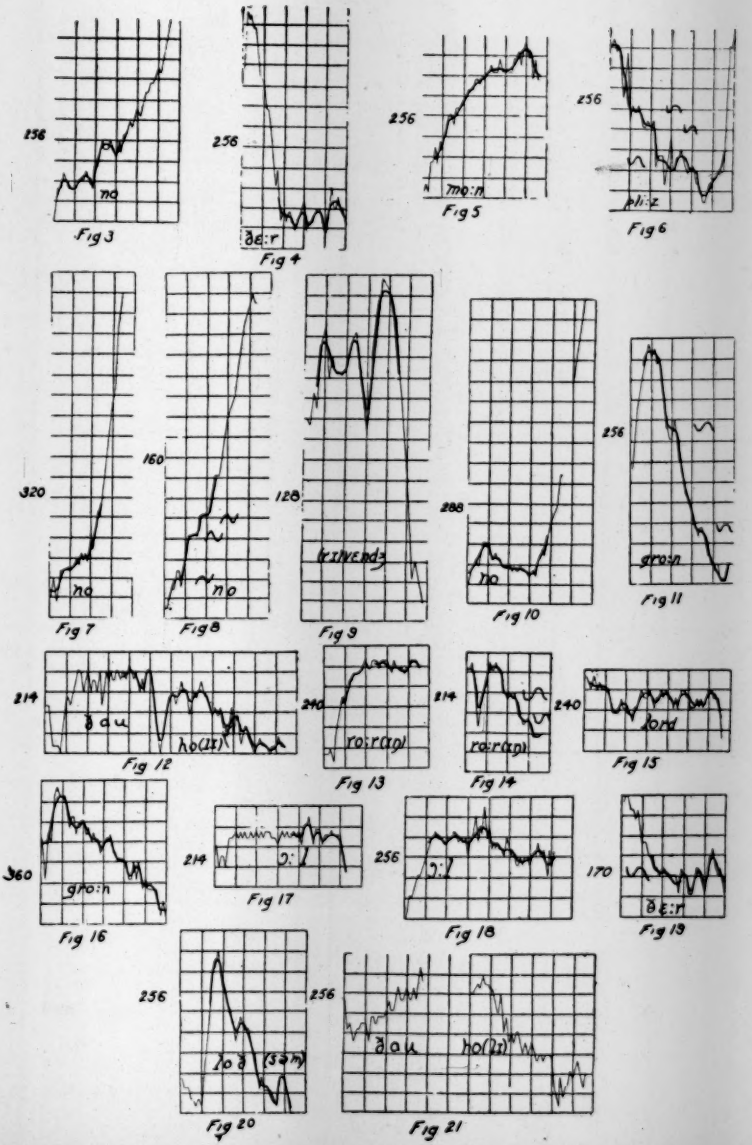
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PLATE II

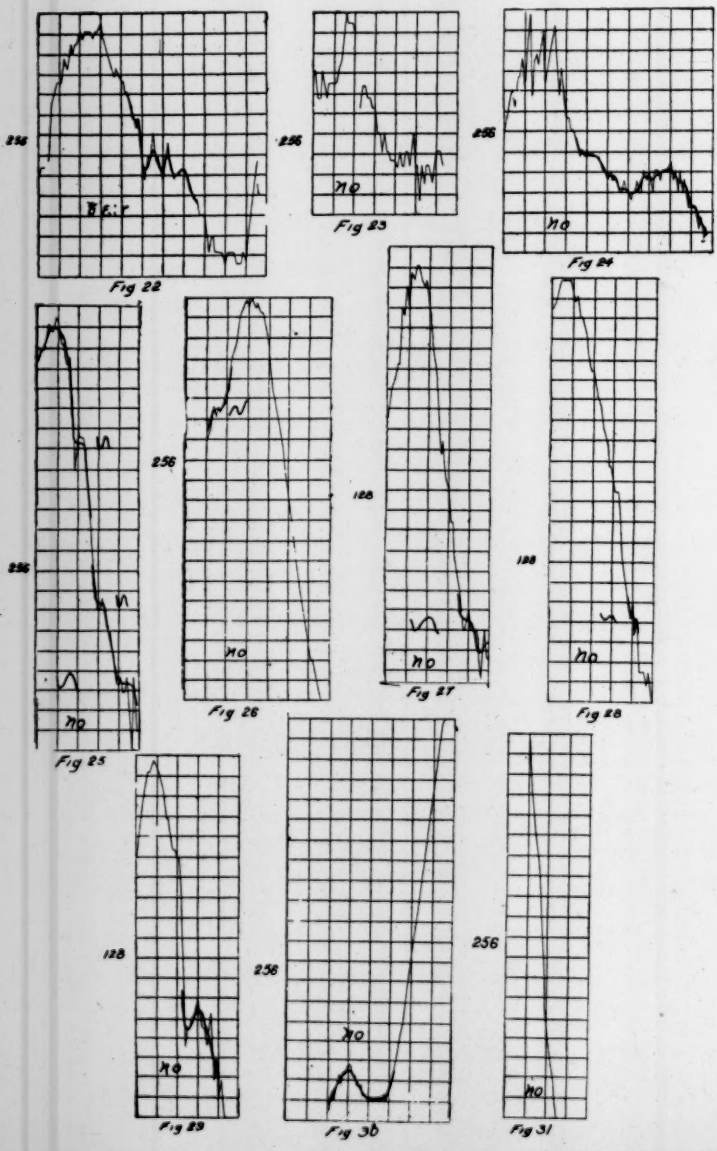
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Fig 22
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PLATE III

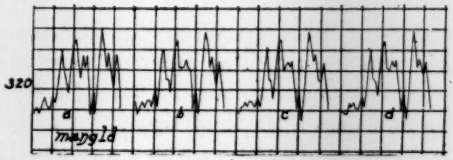

Fig 32

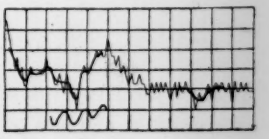

Fig 33

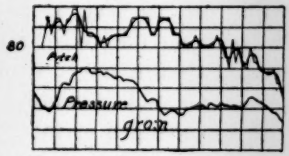

Fig 34

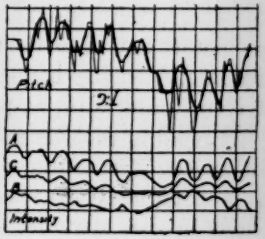

Fig 35

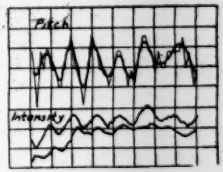

Fig 36

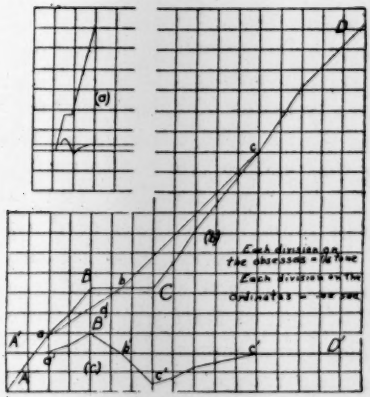

Fig 37

APPENDIX

Technique and Procedure

Method and Apparatus.—In photographing the sounds of speech, both the wave-length and the time-line methods were used. As described by *Simon* (11), the former consists in passing a length of standard motion picture film past a point of light, which oscillates with the sound wave, under conditions in which a given time interval is always represented by the same linear distance on the film. The latter consists of recording on the film, as it passes a given point, not only the sound wave from the voice, but also a "time-line," usually made by the sound from a 100 d. v. electrically driven tuning fork, amplified by a Helmholtz resonator.

In reading records made by the wave-length method, the constant speed of the film being known, the linear distance on the film is computed for each .01 sec., and the number of waves counted in that distance. In reading records made by the time-line method, the time interval is marked off by the time-line, and the number of sound waves from the voice is counted in each interval so determined.

The apparatus used in both of these methods is described by *Metfessel* (4), and need not be described again. However, certain improvements in the original apparatus and technique were made in the course of this study. Previous investigators made use of the direct current, either from the university generator, or from storage batteries (4). Irregularities in the source of current led to the attempt to use alternating current. The objection had been that the pulsations from the 60 cycle generator would cause an intermittent, rather than a steady, line on the film.

By running the regular 110 v. alternating current through a Jefferson Toy Transformer, however, and setting the rheostat for 18 v., it was found that the record on the film was indistinguishable, except on very close scrutiny, from that made by the direct current. It was entirely satisfactory, and has since been used in the studies of *Metfessel* and *Travis*.

Another difficulty encountered was the "buckling" of the film as it passed over the carriage at the point where the light fell on it. This was overcome by placing above, and pressing upon the film, as it passed over the carriage, a small piece of thin glass, which

held the film smooth under all conditions. The edges of the glass were smoothed with emery, to prevent abrasion of the film as it passed under it.

Identification of the film was another problem. A positive identification was desirable, and this was achieved by the simple device of writing on the emulsion side of the film, *before developing,* with an ordinary No. 2 lead pencil. Records thus written are made permanent in the developing, and will serve as a positive and unfailing method of identification.

In order to deaden the natural resonance of the mouthpiece, which consisted of a small metal horn about seven inches long and three inches in diameter at the base, this horn was lined with thick, loose felt.

For readings requiring pitch and intensity, a face mask was used, covering the mouth and nose. This mask consisted of a metal base, shaped to the face, and covered with rubber. The part that came in contact with the face consisted of an inflated rubber rim, so that it could be made to conform closely to the outlines of the face. The observers held this mask tightly against the face. Breath pressure was thus recorded.

Methods of reading films.—The cumulative method of reading films was used. This has been adequately described by *Merry* (6), *Herzberg* (1) and *Simon* (11). In this method, the time interval is determined, either by wave length or time line. The number of complete voice waves in the first interval is counted, to which is added the tenths of the incomplete wave. This gives the total number of waves, with the fraction, in that time interval. For the next interval, the complete waves and the tenths of the incomplete wave are again counted, adding the tenths of a wave left over from the preceding interval. This gives the total waves in that interval. For each succeeding time interval the process is a repetition of this just described.

For the study of the vibrato, readings in tenths of a wave are sufficiently fine to reveal the fluctuations if they are present. The time-intervals used for the most part were in groups of .02 sec. This gave for all practical purposes the smoothest curve, at the same time preserving the essential minor fluctuations that make up the vibrato. The vibrato in singing being a pulsation of from 5.5 to 9 cycles per second, the grouping by .02 sec. allows ample

opportunity for recording the changes taking place in the period of from .11 to .18 sec.; in the former five and one-half readings are taken within the time of one cycle of the vibrato, while in the latter, nine readings are taken. In a few cases, with very low pitches, groups of .02 sec. were taken. *Simon* points out that this is a valid procedure (11).

But if finer readings are desired for some purpose, the following device may be of value. From a short strip of standard motion picture film (about two inches) the emulsion is washed off with warm water. With a fine pointed needle, a line is scratched across the film, perpendicular to the edge. From a point on this line just inside the row of perforations, as a centre, five additional radii are drawn on each side of the perpendicular, two mm. apart at the opposite edge of the film. This gives a fan-shaped, transparent measure, which can be applied to the wave form, and read as fine as tenths of divisions, or hundredths of a wave-length.[1]

To use this device count the complete waves in the given time interval. Place the "fan" so that the centre line is perpendicular to the base-line, moving it up and down until the outside radii

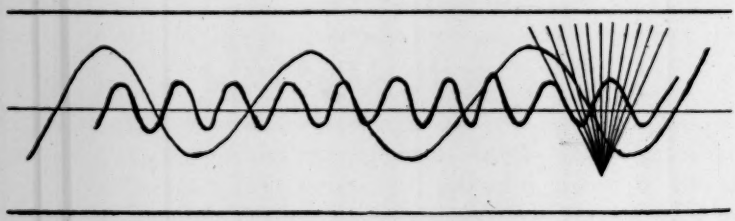

FIG. 38

cross the points of reference for the *next complete wave*. Note the radius which crosses the base-line nearest the point of reference for the terminus of that time interval. Count from the left (if reading from left to right) the number of complete spaces, which will give the tenths, and estimate the position in the next space, where the intersection of the point of reference for the time in-

[1]Working independently and at the same time, *Metfessel* worked out a similar device, using a strip of glass about 1½" x 3", the "fan" being drawn the long way.

terval, for the hundredths. This gives a reading in hundredths of a wave length. It is of course essential that the points of reference for both the time interval and the wave-length be in the same line, whether in the base-line, or in another drawn parallel to it.

In Fig. 38 the large waves are the time line in .01 sec., and the small waves are from the tone to be measured. In the .02 sec. here represented, there are seven complete waves of the latter. At the beginning of the time interval is a fraction of a wave, which is estimated at .75. Following the last complete wave in the time interval is also a fraction of a wave, which, according to the "fan," is exactly .3. Adding these together, 7, .75, and .3, the sum is 8.05, which is the total number of waves in this time interval of .02. Of the incomplete wave at the end .7 is left over to be counted in the next interval.

Errors in reading.—In the cumulative method, where the time line is used, no attempt is made, ordinarily, to read in finer units than .1 wave length. After having counted the number of complete waves in any given time interval, the number of tenths of the incomplete waves is *estimated*. If the linear equivalent for each time interval were constant, as it is in the wave-length method, this estimation might be made by actual measurement, as *Simon* did in his study (11). As it is not constant, however, each estimation must be made separately. For the study of the vibrato this estimation is found to be sufficiently accurate. *Metfessel* has used it in all his studies of the vibrato, and has based his findings on the results obtained by it. If finer readings are desired, however, for a more accurate determination of the minute fluctuations from wave to wave, it may be accomplished by the use of the "fan" device discussed above.

Frequently the point of reference does not fall exactly at any tenth of the wave length. In such cases the nearest tenth is taken, and here is one source of error. But this error need never be more than one-half of one-tenth, or .05 wave length, and it is compensated for in the next interval. By following the rule established by *Schoen* (9), of taking, in case of doubt, or in case the point of reference falls just half-way between two tenths, the measurement which causes the least variation in pitch, this error becomes slight.

Simon has shown (11) that the value of plus or minus .05 mm

error varies from 1 percent of a tone at 64 d. v. to 8 percent at 512 d .v. Since in the present study the pitch rarely went above 320 d. v., the error amounted to less than 5 percent of a tone, for the most part.

Plotting graphs.—On the graphs the horizontal divisions represent .18 sec. in time, and the vertical divisions one semitone in pitch. For pitches between the frequencies of the semitones of the tempered scale, interpolations were made.

A convenient and accurate method of plotting was devised in the following manner (Fig. 39): A six inch 30° x 60° engineers' square was laid on a sheet of graph paper so that the longer leg was parallel to the ordinates. The points of intersection of the hypotenuse with two adjacent ordinates were marked off on the edge of the square, and the distance between them divided into nine equal spaces. From the ten points thus determined, perpendiculars were drawn to the longer leg.

A straight edge ruler is laid parallel to the ordinates in such a way that the first and last points marked off on the hypotenuse of the square, which is placed against it, make intersections with two adjacent ordinates. By moving the square up and down the ruler, so that the successive lines are opposite the pitch readings, dots can be made in the proper positions. When these points are joined, a neat and accurate graph is constructed.

For example, suppose the nine readings to be plotted are: 285, 285, 290, 290, 285, 280, 275, 270. The square, *ABC* is placed against the rule so that the lines *ad* and *bc* intersect two adjacent ordinates at points *a* and *b*, respectively. While the ruler is held firmly so it will not slip on the paper, the square is moved up or down so that the line *ee'* comes opposite the *(interpolated)* reading for 285 on the frequency scale at the left. A dot is made on the paper at point *e*. The square is then moved up slightly, so that line *ii'* is opposite the same reading, and a dot made at *i*. The square is next moved up so that the line *mm'* comes opposite the reading for 290 on the scale, and a dot made at *m*. Similar dots are made for the reading at 290, with line *oo'* and *ss'*. For the reading for 280 again, the square is moved down, so that line *vv'* comes opposite the reading, and the dot is made at *v*. Dots are made similarly at *w, z, and b*, with the lines *ww', zz'*, and *bb'* opposite the readings for the frequencies 280, 275, 270, re-

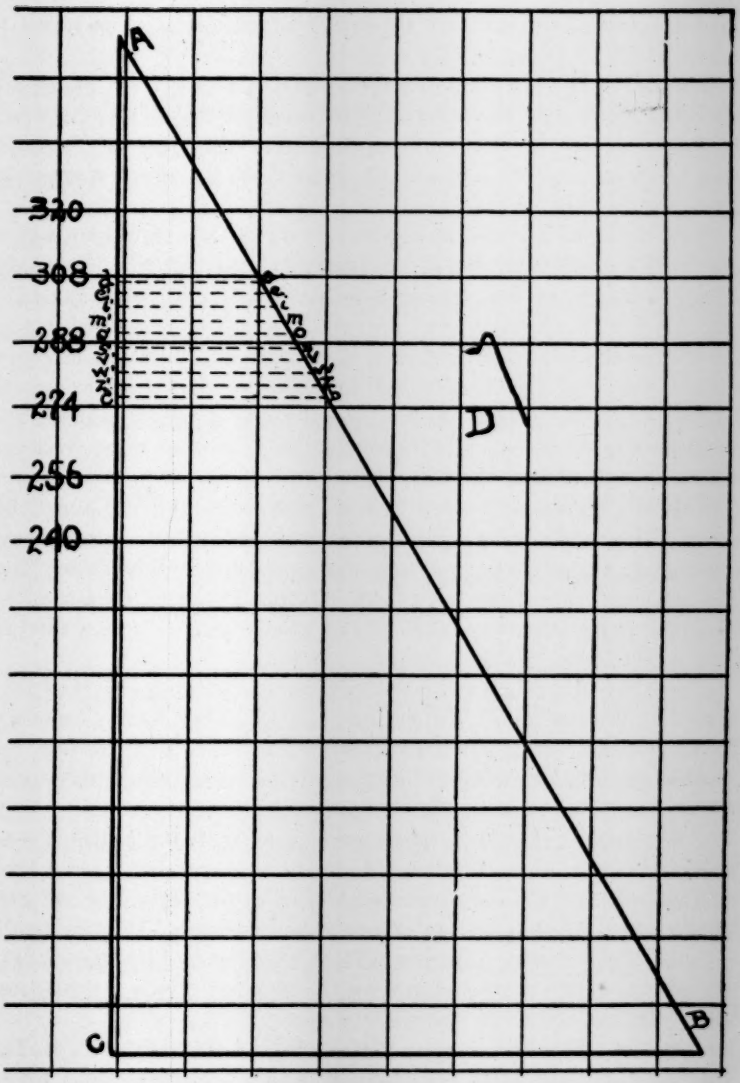

FIG. 39

spectively. Each successive dot has been moved over to the right by one-ninth of the distance between the ordinates. The result is shown at *D*.

Dividing the distance into nine equal spaces gives a graph for readings in groups of .02 sec. If readings of .01 sec. are desired, it is necessary to divide the distance into 18 equal spaces. If readings in groups of .03 sec. are to be plotted, six equal spaces are necessary.

Preliminary steps.—As a preliminary to the actual investigation, *Metfessel's* graphs of Bryan's "Immortality" (3), and Merry's graphs of Sothern's Shylock's speech (6) were carefully examined. The former gave no evidence of the presence of anything like the periodic fluctuations or pulsations, but *Merry's* records gave a sufficient number to indicate that further search might be fruitful. Twelve cases were found, of which perhaps two or three might be classed as doubtful, in that they were considerably faster or slower than the usual rate of the vibrato. Thus, in the clause, "mocked at my loss*es*," in which the italic syllable shows the fluctuations, there are two "peaks, about .1 sec. apart, making a rate of 10 per second. This is considerably faster than the average rate found by any of the previous investigators. Similarly, the second syllable of the word "tickle" has a fluctuation rate of about 14 per second.

On the other hand, in the graphs of William G. McAdoo's speech, "Revise Taxes," the phrase, "No, *they* have," contains in the italicized word only two peaks in .42 sec., or a rate of less than 5 per second. However, these and the remaining nine cases pointed out that there is an ample field for investigation.

The first photographs taken were from E. J. Ballantine's reading of "The Ancient Mariner."[2] Eight words were selected from this record, and photographed according to the technique referred to above. Various methods of readings were tried, the one finally selected being the wave-length method, as described by *Simon* (11), where 2.549 cm. linear distance on the film represents a time interval of .01 sec.

It is to be noted that in the reading of this selection, Ballantine does not use what may be called the "conversational tone."

[2]"The Ancient Mariner," by E. J. Ballantine; No. 250 in "The Spoken Word," a series of phonograph records edited by W. P. Daggett, 202 W. 74th St., New York.

On the contrary, he uses what many would call the "singing tone," characterized by the absence of the inflections which *Merry* and *Metfessel* found in the readings and speeches of Sothern, Bryan, Rabbi Wise, and others. Of the eight words, five show a periodicity in pitch change. One other shows one cycle, at a rate apparently corresponding to the vibrato, but since it takes at least two cycles to establish a periodicity, this case was discarded. The other two of the eight show no periodicity whatever.

The next phonograph record to be chosen was E. H. Sothern's reading of the Shylock Defense from "The Merchant of Venice," Victor Record, No. 74673. Nine words were selected and photographed. Of these nine, five contain within them a periodic pulsation on two or more peaks, thus verifying, in so far as it goes, the findings from reading *Merry's* graphs (6).

As a third preliminary step, certain words from *Metfessel's* film of Bryan's "Immortality" were re-read. The difficulty presented itself of finding syllables held long enough to contain within them at least two cycles. But the reading of the five words selected confirms the conclusions reached from studying *Metfessel's* graphs (3), that the vibrato is not a characteristic of Bryan's speech.

Of the 22 records read, then, 12, or 54%, show the presence of fluctuations in pitch which follow quite closely the characteristics of the vibrato.

Final procedure.—In the study of pitch variations, 213 photographs were taken directly from the voices of 23 observers, selected mainly from among major students in speech and instructors in the department. Only one falls outside either of these groups, but he has taken during the past two years a prominent part in the dramatic activities of the University Theatre, and is considered to have a "good" voice. These photographs were made under various conditions and moods, using different vowel sounds as they occurred in words and in sentences.

In all cases the observers were told that the value of the record lay in their entering into and feeling the mood desired; and judging from introspective evidence, it was considered that the word as spoken into the mouthpiece was a faithful expression of the mood. No one knew the object of the experiment at the time the record was made.

At first the single word, "No," was used, but later entire sentences were substituted, a single word being photographed from the entire sentence. *Soothing,* for instance, was represented by the sentence, "*There,* little girl, don't cry," from James Whitcomb Riley's "A Life Lesson," the first word being recorded. *Doubt* or *uncertainty* was represented by the sentence, "Well, *no,* I don't think so." *Loneliness* by "No home, *no* friends," this being an extemporaneous phrase originated by one of the observers when asked to express the mood of loneliness using the word "no." *Pleading* was expressed by the sentence, "Please, *please* don't go!" *Desolation* was expressed by the italicized word in the quotation,

"A lonely lake, a lonely shore,
A lone pine leaning on the moon;
All night long the water-beating wings
Of a solitary loon,"

from Lew Sarett's "The Loon," and also from the italicized words in the line,

"*Weird* as the *moan* of sobbing winds,"

from the same author's "The Wolf Cry." *Awe* was represented by the line,

"But soon I heard a *roaring* wind,"

from "The Ancient Mariner." *Reverence* was expressed by "Thou holy One," and by a paraphrase of Kipling's Recessional,"

"O *Lord* of Hosts, be with us yet."

Horror was expressed, in at least one instance, by the quotation,

"Pluck the *mangled* Tybalt from his shroud," from "Romeo and Juliet." (Iv, iii).

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END OF SPECIAL SECTION

MOTOR CONTROL AND ABILITY IN INTERPRETATION*

WILLIAM JOHN MILLER
Northwestern University

The problem of the relation between motor control and ability in interpretation is still in its theoretical stage. These two studies were undertaken by way of introduction to experimental procedure in connection with this phase of the field of speech.

From the many forms of motor control which are open to investigation, two were selected because of their more elementary nature and the comparative absence of uncontrolled factors. These two were steadiness of movement and inhibition of the wink reflex.

Fifty students in the School of Speech acted as subjects in each test. These subjects were ranked according to their ability in interpretation as measured by the grades they received in private lessons in the school. The results of the experiment are stated as agreements and correlations between the rankings on the bases of their ability and their test scores.

I.

THE STEADINESS TEST

This test reveals the subject's ability to control a voluntary movement, and hence forms an index of general motor control. Opinions differ, of course, concerning the role of purely motor processes in the various forms of expression of thought and emotion. But whatever the view held, a correlation between the score on a test of this kind and ability in interpretation is not without interest.

The technique adopted for the experiment consisted of passing a metal stylus along a narrow slit between metallic strips and recording the number of contacts between stylus and strips by means of the clicks of a telegraph sounder. The slit was shaped like a long, narrow V, and was of such size that no subject was able to trace the narrowest end without a contact.

*One of a series of minor studies from the laboratory of the School of Speech, Northwestern University. Supervised and edited by Clarence T. Simon.

The procedure was the one standardized by Whipple.[1] The subject was seated with the tracing board squarely in front of him, the apex of the V toward his body. He held the stylus as he chose, placed the point at the more open end of the path, and attempted to draw the stylus to the narrow end of the maze without touching the strips on either side. The movement was continuous from start to finish, and was made with the whole arm. The rate of movement, such that the length of the board was traversed in nine seconds, was illustrated by the experimenter. The subjects were allowed two preliminary trials with each hand to secure the correct rate of movement and to become adjusted to the demands of the apparatus. After the preliminary trials, each subject traced the maze, alternately with the right and left hands, five trials with each. The test was scored by the number of times the subject touched either guiding strip with the stylus[2]; thus that distance which the stylus travels to the time of the first contact. a high score indicates a lack of steadiness, or poor motor control.

The results obtained from this simple test were compared with the ranking according to interpretative ability. For the first comparison, the fifty subjects were divided into two divisions, the twenty-five high and the twenty-five low, in both the test score and grades in interpretation. When this was done, it was found that 60% of the upper half in interpretative ability were also in the upper half of the test scores; and that 60% of the lower group in interpretation were in the same group on the test. When the ranks of all subjects in the test were correlated with the ranks in interpretation, using the Spearman coefficient for rank-differences $(1 - \frac{\Sigma D^2}{c})$, a correlation of + .3153, ' P. E. ± .0919 was obtained.

II

INHIBITION OF THE WINK REFLEX

Briefly, the theoretical basis for this particular investigation concerns the role of habits of the motor variety in technique. Development of technique in interpretation, as in other art forms, in part at least is the elimination of existing motor habit and re-

[1]Whipple, Guy Montrose. *Manual of Mental and Physical Tests.* Part I, 1914, pp. 151-5.

[2]This method differs from that suggested by Whipple. He records

flex patterns and the establishing of new ones. Accordingly it would seem, a priori, that that student who most readily can inhibit old habits and establish new ones in their places will be able to develop more quickly and completely a satisfactory technique for the interpretation of literature. The wink reflex was selected as the object of study because it is simple, universal, and as a reflex, represents an elementary form of motor pattern.

The apparatus as constructed in the laboratory, consisted of a base supporting a vertical glass plate against which the subject rested his forehead. Two cork hammers were pivoted to the base, and were arranged to strike the glass, one in front of each eye. A cardboard screen at the opposite end of the base from the glass carried a target on which the subject fixed his gaze and also concealed the movements of the experimenter's hands as he pulled the cords working the hammers.

When the subject had seated himself comfortably, with his forehead against the glass, he was told that the hammers would strike the glass plate, but that he was to maintain a steady, unwinking gaze at the fixation target. Five preliminary trials were given, followed by forty-eight recorded trials, sixteen each with the right hammer, the left, and both together. The order of striking was broken, so that the subject never knew which one to expect.

Each trial was scored as a complete inhibition, a partial inhibition, or a complete failure, and given the corresponding grade of 2, 1, or 0. The sum of these grades indicated the subject's ability to inhibit this deep-seated reflex act; a high score indicating facility in inhibition.

When the subjects were divided into groups, as for the steadiness test, the following agreements were found: 57.61% of those in the top half in interpretation were also in the top half for inhibition; while 58.27% of the lower half of interpretation were also low in their test scores. The correlation between the two rankings in their entirety was + .3419, P. E. ± .095.

SUMMARY

The percentages and correlations found here are not large enough to warrant any conclusions concerning the use of these tests as indicative of probable ability in interpretation. At the same time, they are larger than the zero values which might be assigned without reference to experimental evidence. They are

certainly large enough to justify further investigation of motor capacity as a factor of ability in the interpretation of literature.

HOW FAST DO WE TALK?

WILLIAM NORWOOD BRIGANCE
Wabash College

How fast does the average speaker talk and how does his rate compare with the rate of the average reader? The following item, taken from a news magazine, was given much prominence last year:

> A congregation in Penn Yan, N. Y., undertook to read aloud the entire Bible in one day, by a relay team of 200 fast-speakers. The head man commenced: 'In the beginning God created,' etc., at 3 a. m. The tail man finished '.... be with you all. Amen,' at 8 p. m.
>
> The Bible contains 774,692 words. Between 3 a. m. and 8 p. m. are 1,020 minutes. Therefore, the readers averaged 759 words a minute. A fluent speaker does well to get out 150 words a minute. [1]

In pursuing this inquiry further, I turned to a measurement of the phonograph record made by William Jennings Bryan, shortly before his death, of the famous "Cross of Gold" speech. In measuring the rate of speaking from a phonograph record there is, of course, a "probable error" of perhaps 15% arising from the varying rate of speed at which the reproducing machine is run. But setting the machine at the standard rate—the rate at which the recording machine is supposed to run in making the original record—Bryan's rate of speaking was exactly 150 words a minute. The maximum "probable error" would not have reduced this below 143 words or raised it above 157.

Bryan's rate of speaking in this record seemed to me distinctly faster than his average in extempore speech. This is only an impression, unsupported by any actual measurement of his rate in extempore speaking, yet, as a former resident of Lincoln, Nebraska, it has been my privilege to hear him speak under many

[1] From the news magazine, TIME, of unknown date.

and varied conditions, and so distinct is my impression that I do not hesitate to state as a fact that Bryan's rate of extempore speaking was much less than 150 words a minute. I would account for his faster rate in making this record upon the ground that he undoubtedly read his speech from a manuscript and—as almost all speakers do in reading—uttered it at a faster rate than in normal extempore speech.

The phonograph records of E. H. Sothern in Shakespearean drama give us an excellent indication of the varying rate that one actor gives to different kinds of discourse. In *As You Like It*, Jaques' well known rumination, "All the world's a stage," is spoken at 112 words a minute. In *Julius Caesar*, the somewhat heated conversation between Brutus and Portia—with Julia Marlowe as Portia—in Act 2, Scene 1, is carried on at 135 words a minute, while Portia at her most angry moments rises to nearly 150 words a minute. The greatest contrast, however, appears in *Hamlet*. The soliloquy, "to be or not to be," is spoken by Sothern at the exceedingly slow rate of 80 words a minute, while Hamlet's advice to the players in the scene following is raced off "trippingly on the tongue" at the pace of 170 words a minute. The first two scenes, however,—at the rates of 112 and 135 words a minute, represent the general limits of Sothern in ordinary discourse.

Of still greater significance, from the view of actual speaking, is a record of the rate of speaking among college students taken from twenty winners of intercollegiate oratorical contests. Since these winners of state contests were representing their respective states in the contests of the Interstate Oratorical Association, and copies of their speeches were published, it was relatively easy to secure their rate of speaking by counting the number of words in the speeches and then holding a stop watch upon each of them during the delivery of these speeches. The results should give a fairly exact indication of the rate of speaking, at least among intercollegiate oratorical contestants, if not among the average run of all speakers.

Of these twenty speakers, the slowest spoke at a rate of 83 words a minute and the fastest, almost twice as fast, at the rate of 154 words a minute. The average of the whole group was 120 words a minute. Below is listed the rate for each speaker.

WORDS PER MINUTE	NUMBER OF SPEAKERS AT THIS RATE	QUALITY OF DELIVERY
83	1	Poor
90	1	Good
100	2	
107	1	Good
111	2	
118	3	
121	1	Poor (1) & Good (1)
123	1	Good
125	1	Good
131	1	
133	3	
140	1	
143	1	Poor
154	1	

In the right hand column I have noted opposite the rate of speaking, five speakers whose delivery seemed to me to be distinctly superior and three that seemed distinctly poor. Of the twenty speakers, the best, as I rated them, was the one speaking at 90 words a minute. He had a great deep-toned voice of almost unlimited power, with a thrilling, vibrant quality, a voice that cut through all the little reverberating noises of the hall and commanded attention. He spoke with more than averaging force and with a moving quality that led one to believe that he was not speaking any slower than the average. But his sustaining vowels, prolongation of words and full pauses cut his rate of speaking to exactly 25% below the average. His delivery was so pleasing that, to hear him, one would be tempted to believe this slow rate of speaking an ideal one for most speakers. But this would be decidedly in error, for on the other hand, the poorest, distinctly, of all these twenty speakers was the one speaking at 83 words a minute. He, unlike the above speaker, did not possess a voice of great power, not one of unusual quality. It was just an average voice, yet one which could, nevertheless, have been made pleasing. But his manner of speaking seemed to be an artificially calculated dragging out of words in a most listless manner, a manner that kept the audience—that is to say, that part of the audience whose thoughts had not wandered off to other things—wearily waiting for his next phrase.

Very many elements enter into the making of a good delivery —voice quality, tone color, subtleties of force and pitch, rhythm, articulation, etc., *ad infinitum*, to say nothing of mental attitude and bodily action. It is, therefore, impossible to draw any conclusions upon the rate of good speaking solely from the information offered in the above table. However, basing my opinion upon these speakers as I heard them, and separating the rate of speaking from all other elements of delivery, I should say that the best *average rate* for the *average voice* lies between 115 and 135 words a minute. When a speaker possesses (1) a voice of unusual melody and richness which allows a pleasing and natural prolongation of tones and (2) sufficient strength to speak slowly yet with a *moving quality* instead of allowing tones to drag listlessly, then he may effectively speak at a slower rate. Out of the seven intercollegiate orators who spoke slower than 115 words a minute, only two were able to do so effectively. One was the speaker discussed above with the rate of 90 words a minute, and the other, very much like him in manner and voice, was the one who spoke at 107 words a minute. The other five, lacking these essential qualities, were, through sheer listlessness, below the average in effective delivery.

Upon the other hand, a speaker possessed of a spontaneous, rippling manner of utterance might possibly speak faster than 135 words a minute. Bryan, as his words come from the phonograph at 150 words a minute, does not seem to be speaking too fast. The student listed in the above table at the fastest rate, 154 words a minute, was an effective speaker; not among the very best of the list, but nevertheless a pleasing speaker. However, I am of the opinion that at a slower rate of utterance, his effectiveness would have been increased. I have found this so with many naturally fast speakers. Take, for illustration, the student in the above table whose rate was 123 words a minute. He happened to be one of my own students. His manner was of a rippling, flowing, spontaneous sort. At his natural gate in two different local contests, he averaged about 135 words a minute. After giving him a little personal attention and pointing out to him the advantages, from the standpoint of good communication, of centering a little more firmly than he had been doing, I found that his rate of speaking dropped to 123 words a minute. Both of us were convinced that, at

this rate, his delivery was more effective than at the faster rate. I am of the impression that this is true of most fast speakers.

One of the greatest problems confronting the beginning speaker—as every teacher of speech knows—is to adjust the rate of speaking so as to squeeze out of his words the maximum meaning. For at least three-fourths of beginners, this means learning how to slow down and to center upon the thoughts more firmly and vigorously. In my experience, at least, it is not at all unusual for such a beginner—after reading carefully what the best of texts say upon centering, pausing, quantity, rhythm, and the like and then listening to phonograph records illustrating what good speaking is like, all superimposed upon short drills of his own—to start off putting theory into practice at the rate of 175 to 200 words a minute, truly justifying the indictment of Hamlet against those who "tear a passion to tatters, to very rags."

How does the rate of speaking compare with that of reading? Roughly, it is about one-third as fast. The average rate of reading on non-technical matter is, perhaps, from 300 to 400 words a minute. The rate for technical matter or heavy reading of any sort, may fall as low as one-tenth of this normal rate, but this rate of 300 to 400 words a minute holds for reading matter of roughly the same grade as the average speech given before a general audience.

The reason for this wide discrepancy of rate between reading and speaking is obvious. The reader's eye travels at the maximum comfortable speed, taking in groups at one glance and passing rapidly on to succeeding groups. From a purely mechanical viewpoint, this is a much simpler process than the complex procedure of bringing into play the lips, tongue, and muscles of the face and neck that control the voice box. The mechanics of utterance is more detailed and exacting than that of painting an expression upon the retina of the eye. Then too, a good speaker squeezes out of his words more than the average reader. He gives to them what Mark Twain called "its soul . . . color, play of feature, varying modulations . . . informing inflections," while at best the written word is something of a "pallid, stiff . . . cadaver . . . lying in state."

Who has not heard some literary critic, actual or self appointed, complain that some great speech "does not read as well as it sounded." As if any print "lying in state," could reach the

heights of the living, spoken word, backed by the personality of a great speaker! It is this giving of life and soul to words which requires a longer time element than the quick absorption, by a glance of the eye, of the printed word.

SOME STATISTICS CONCERNING INTERPRETATION COURSES*

HELENE WILSON
State Normal School, Oshkosh, Michigan

These statistics were gathered as a part of the plan to make some study of the aim and content of courses in Interpretative Reading in academic institutions in the United States. They enlarge upon the data gathered and reported last December by Professor Gertrude E Johnson at the New York meeting. The results of this study are quite similar to those found by Professor Johnson, namely, that courses in Interpretative Reading have a great diversity of title, aim, and content.

Several methods suggested themselves for the gathering of data needed. Doubtless the only exhaustive method would be to enroll in and follow each course considered. This might be possible for the study of a very few courses, but for a large number at a great many different institutions it would be practically impossible. A second method would be by personal conference with instructors and department heads. But this would be an expensive process and were it possible, in many cases it would not be satisfactory because a large number of department heads as well as instructors teaching these courses do not have a clear notion of the exact purpose of their work. At least, if they do, talking to them does not reveal that purpose. There is also the questionnaire system, but the fact that it has been so commonly resorted to makes it less valuable, as many people refuse to fill out blanks or do so hurriedly and inadequately.

*This is a portion of a report to be submitted at the 1926 Convention. It is published at this time by request of the Interpretation Section in order that it may be in the hands of the members before the Convention.

Since it was academic courses we wanted to study, there was yet another method of gathering data, viz: through the college catalogue. Most collegiate institutions print, in their yearly bulletins or catalogues, course descriptions for each subject in the curriculum. From this source then can be gathered course titles and some information on course content and aims. This then was a possible means of collecting data on a large number of courses and seemed most practicable. It is realized that this is not an ideal source. For instance there are institutions that limit their course descriptions to one or two lines. But except where such limitations exist, catalogue course descriptions offer fairly clear data as to work included in each course.

The effort was made to select the Interpretative Reading courses from all institutions of higher academic rating with the exception of the smaller men's and women's colleges. One hundred twenty colleges and universities, and twenty-three normal schools and teachers' colleges were found in which some kind of Interpretation or Reading courses are offered. These courses are the basis of these statistics. The tabulations are from this group chosen from a larger group of over three hundred.

In the course of this study it was early discovered that Interpretation is taught in many courses other than those designated Interpretative Reading—especially in courses labeled Literature, Public Speaking, Voice, Oratory, Dramatics, and very often in beginning Speech courses. Catalogue description of the above mentioned courses are prone to include oral interpretation, the principles of oral reading, interpretation of literary forms and so forth. In fact it is quite the usual thing to find the term interpretation used in one way or another to describe these courses. This would seem to indicate that interpretation permeates many phases of Speech and Literature, perhaps all of them.

But what is Interpretative Reading, *per se?* Upon what grounds does it justify its place in our curriculum?

Our institutions of learning offer two types of education. One has to do with impression, the other expression. The latter is often thought of as the result of the former. Now Interpretative Reading, like music or any other art, embraces both of these educational ends. We read the page to understand and appreciate the content therein, and we interpret it aloud for the enjoyment of ourselves and of others.

We might expect that all courses with the above aims as their primary goal would be similarly titled. However, anything but this is true. In fact we find a deluge of course names. Work in interpretation of the page is offered under the guise of Voice, Elementary Elocution, Literary Analysis, Interpretative Literature, Oral Expression, Oral Study of Literature, Imagination and the Dramatic Instinct, Evolution of Expression, and Psychological Development of Expression, while in the following courses interpretation as an art-product seems to be the goal:

Classical Literature, Dramatic Expression, Interpretative Analysis, Advanced Literary Analysis, Interpretative Study of Literature, Interpretative Study of Browning, Interpretative Study of Shakespeare, Classical Drama, Shakespeare, Browning, Dialect, Imagination and the Dramatic Instinct, Browning and the Dramatic Monologue, Dramatic Monologue, Impersonation, and Platform Art.

Variety in course titles we find in other fields as well as in the one under consideration, for instance in Art, Music, and certainly in Literature. It is doubtful, however, whether a greater diversity of titles exist anywhere than in Interpretative Reading.

Another investigation might be made as to the number of courses, (other than Interpretative Reading), in which Interpretation or Reading is dwelt upon. After such a study, doubtless we would be better informed as to the place and relative importance of Interpretation in the Speech field or in the collegiate curriculum.

The utmost difficulty was encountered at the very outset in the attempt to classify this deluge of miscellaneous course titles. Finally it became evident that the only terms common to a large majority of titles were Interpretation and Reading.

Of the colleges and universities, one hundred twenty institutions were found offering courses where either the word Interpretation or Reading appears in the course name. For instance, we have Vocal *Interpretation*, Oral *Reading*, *Interpretation* of Masterpieces, Principles of *Reading* and so on. Although the institutions offering such courses number one hundred twenty, the courses labeled in this manner are two hundred three, not quite two courses per college. The number, two hundred three, includes quarter, semester, and year courses.

Of these two hundred three courses called Intrepretation or

Reading, there are eighty-five different titles. There are 118 duplicate titles.

TABLE I-1
Colleges and Universities

Generic Term	No. of Courses	General Qualification	Specific Qualification
Reading	4		
"	3	Advanced	
"	17	Interpretative	
"	1	"	Elementary
"	2	"	Advanced
"	1	"	Seminar in
"	1	"	and Dramatic
"	3	"	of Shakespearean Drama 1
			" Modern " 1
			" Dramatic Literature 1
"	1	of Poetry	
"	1*	and Interpretation	
"	4	and Speaking	
"	2	Aloud	
"	1	"	Art of
"	5	Oral	
"	1	"	Theory of
"	1*	"	and Interpretation of Literature
"	7	Dramatic	
"	2	"	Advanced
"	1	of Dramatic Literature	
"	5	Shakespearean	
"	2	Play	
"	1	"	Advanced
"	1	Bible	
"	2	Hymn and Bible	
"	1	Hymn and Scripture	Pulpit
"	1	and Delivery	
"	4	Platform	
"	2	Public	
"	1	"	Beginning
"	1	"	Advanced
"	1	Principles of	
"	1	Technique of	
"	1	" "	Fundamental

*Duplicated under Interpretation.

No. of institutions offering courses in Reading 56
No. of different courses in Reading 35
No. of duplicate courses in Reading 47
Total No. of courses in Reading 82

TABLE I-2
Colleges and Universities

Generic Term	No. of Courses	General Qualification	Specific Qualification
Interpretation	7	Fundamentals of	
"	1	" " ------	of Expression and
"	1	Elementary	
"	10	Advanced	
"	12	of Printed Page------1	
		" Literature --------1	
		" Poetry ----------2	
		" Masterpieces -----1	
		" Shakespeare -----2	
		" Drama ----------1	
		" " Modern ----1	
		" " Elizabethan 1	
		" " Greek -----1	
		" Standard Plays----1	
"	6	Oral	Advanced
"	1	" ----------	of Literature 8
"	14	" ----------	" Masterpieces 1
			" Modern Drama 1
			" Bible 1
			" Tennyson 2
			" Browning 1
"	3	Vocal	
"	12	" ----------	of Shakespeare ---------2
			" Literature ----------3
			" " Present Day -----1
			" " Lyric & Dramatic 1
			" Poetry ----------1
			" " of Browning ----1
			" " and the Drama --1
			" Scripture
"	2	" ----------	" Bible ----------1
"	1	of Bible ----------	Analysis and
"	4	Literary Analysis &	Vocal and Literary
"	16	Literary	
"	3	" ----------	of Poetry 1
			" Shakespeare 1
			" Modern Drama 1
"	16	Dramatic	
"	1	" ----------	Advanced
"	1	" ----------	of Shakespearean Plays
"	1	" ----------	and Play Production

TABLE I-2 (Continued)
Colleges and Universities

Generic Term	No. of Courses	General Qualification	Specific Qualification
Interpretation	2	Literary & Dramatic	
"		Lyric	
"	1*	Reading and	
"	1	Art of	
"	1*	of Literature ----------	and----Oral Reading
"	1	& Effective Speaking	
"	1	Extempore Speaking &	
"	1	Professional	

*Duplicated under Reading.

No. of Institutions offering Interpretation---------- 86
Different titles in Interpretation---------- 52
Duplicate titles in Interpretation---------- 71
Total No. of courses in Interpretation----------123

For a moment let us consider the courses in the titles of which the word Reading occurs. We find thirty-five different titles and forty-seven duplicates (See Table I-1). The Interpretation situation is more prolific yet. We find fifty-two different titles and seventy-one duplicates (See Table I-2).

We thus find that of the two terms, Reading and Interpretation, the latter is used by more institutions, eighty-six in number. And we find one hundred twenty-three courses of *Interpretation* in these institutions. The word *Reading,* on the other hand, is used in course titles by only fifty-six schools and in eighty-two course titles.

SUMMARY

	Interpretation	Reading	Total
Institutions offering courses----------	86	56	120
Different titles----------	52	35	85*
Duplicate titles----------	71	47	118
No. of courses offered----------	123	82	203

*There are two titles in which both terms appear.

We now turn to the situation in the normal schools and teachers' colleges. Since organization and method are stressed in these schools, we might expect that less confusion would be evident in the particular study under consideration. We find, however, that quite a similar situation exists. Twenty-three normal schools and teachers' colleges offer courses termed some kind of Interpretation or Reading. And in these twenty-three schools forty courses called Interpretation or Reading are found. Thus we

see that the normal school as well as the college and university manifests a definite interest in Interpretative Reading. Again we are faced with diversity of title, aim, and content. The college situation showed eighty-five various course titles in one-hundred twenty institutions. The normals schools show a greater variety for the number of schools concerned. In fact, these twenty-three normal institutions use twenty-eight different titles, an average of more than one per school. There are twelve duplicate titles.

While, as we have seen, colleges and universities use the term *Interpretation*, more frequently than *Reading* in course titles, normal schools, on the other hand, do the opposite. Twenty-two courses called some kind of Reading and eighteen in Interpretation were listed in these institutions. The different Reading titles are sixteen, those in Interpretation, twelve. (See Table II).

This preference for the title Reading is probably due to the

TABLE II-1
Normal Schools and Teachers' Colleges

Generic Term	No. of Courses	General Qualification	Specific Qualification
Reading	3		
"	1	Elementary	
"	1	Beginning	
"	1	Advanced	
"	4	Interpretative	
"	1	" -------	Fundamentals of
"	2	Oral	
"	1	" ----------	and Expression
"	1	Expressive	
"	2	of Poetry	
"	1	in Victorian Poets	
"	1	Shakespearian	
"	1	Critical	
"	1	Recital	
"	1	Platform	
"	1	Public	

Total

No. of institutions offering *Reading*	15
Different titles in Reading	16
Duplicate titles in Reading	6
Total No. of courses in Reading	22

TABLE II-2
Normal Schools and Teachers' Colleges

Generic Term	No. of Courses	General Qualification	Specific Qualification
Interpretation	3		
"	1	Advanced	
"	3	of Printed Page 1	
"		Drama 1	
"		Poetry 1	
"	2	Oral	
"	1	" ----------	of Modern Literature
"	1	" ----------	Speech Composition and
"	1	Vocal	of Shakespeare
"	2	Literary	
"	1	Poetic	
"	3	Dramatic	

Total

No. of institutions offering Interpretation	13
Different titles in Interpretation	12
Duplicate titles in Interpretation	6
Total No. of courses in Interpretation	18

presence of that subject in the grade school curriculum where many normal school students plan to teach. For instance, the object of a course titled, Beginning Reading, is "to make better teachers of reading by making teachers better readers."

Such courses as Methods in Teaching Reading and Teachers' Reading are not included in this study as their aim is not toward Interpretation but toward teaching methods for grade schools as the titles imply. In general the list of miscellaneous titles for Interpretative Reading courses in normal schools is far less than that of the colleges and universities, probably due to the general emphasis on methods in the former group of institutions. We find expression, Oral Expression, Oral Appreciation of Literature, and even the cloak "Public Speaking" covering this work.

We now turn to a study of some of the individual titles included in the classified tables. The single word Reading is used by four college and three normal courses. This term has many unfortunate connotations. It recalls grammar school struggles in the "three R's"; it brings to mind the usual grade school reading les-

son which is humdrum and everything but real interpretation of the matter read. Perhaps it brings to mind some public address which was delivered from the manuscript and delivered meaninglessly. Mayhap Reading reminds us of last Sunday's scripture or responsive reading which was monotony throughout. All of us do so much hurried reading, so much skimming of the page, and most of us are such abominable readers that even the course titles, Reading of Poetry, Reading of Shakespearean Drama, and Play Reading suggests a drab process of stumbling over meaningless words and phrases. ' It is quite possible that these associations may be one of the reasons that the other term, Interpretation, is more commonly used in colleges.

But even Interpretation when used alone is misleading. It occurs seven times for college and three for normal courses. However, there is interpretation of so many things that this word as well as Reading needs modification. We have, for instance, Interpretation of Browning, of Tennyson, and Keats which may be purely English courses. And we talk of the interpretation of our national constitution, of laws, of signs. This noun if used as a course title ought to be qualified in some way so that the special kind of interpretation intended is understood. One should at least be able to tell from a course title to what department the course belongs.

Literary Interpretation titles sixteen college and two normal courses. But this name suggests the realm of the English department rather than Speech. In fact, certain English courses are given under this name.

The word Oral is not uncommon in titles. It appears in twenty-eight college and seven normal course titles. Oral means mouth, or verbal. So then, Oral Reading is the opposite of silent reading; it means utterance while reading; it means Reading Aloud, the label used for two courses tabulated. We speak of oral problems in Arithmetic to differentiate from those which are written. In the same manner, we refer to examinations and also composition as oral or written. But Interpretative Reading should mean much more than just utterance. Interpretative Reading is an activity which begins with the understanding of the printed page and which when completely executed, is a dramatic rendering of the selection. It may be that the word, Oral, was adopted for these courses to differentiate them from the work in Eng-

lish which was not oral. At least when we find the Speech work in the English department we can often find the sub-head, Oral English, under which Speech is listed.

The term Vocal while not occurring so often as Oral, is worthy of note. It appears in eighteen college course titles and in one normal school course title.

	Colleges	Normal School
Occurence of term, Oral	28	7
Occurrence of term, Vocal	18	1
Total	46	8

By Vocal is meant, uttered, oral, or voiced. To be sure the voice side of Interpretative Reading is a goodly part., But Interpretative Reading embraces more than this.

A glance at the title tables shows frequent use of the terms, Drama and Dramatic. These words indicate rather well the nature of the courses to which they belong. Drama means doing; it carries the idea of complete, intense, vivid activity. The courses called Dramatic Interpretation, for instance, are not confined to the printed page; they deal in scene work, in characterization, and in presentation of plays. The same thing is true of courses called Shakespeare or Plays.

	Colleges	Normal Schools
Occurence of term, Dramatic	34	3
Occurrence of term, Drama	9	1
Occurrence of term, Shakespeare or Shakespearean	10	2
Occurrence of term, Play or Plays	5	6
Total	58*	6

*2 titles in which 2 of these terms appear.

The Public element characterizes both college and normal courses. Public, Platform, Delivery, Professional, or Recital occur in Interpretation or Reading titles thirteen times.

	Colleges	Normal Schools
Occurrence of term, Platform	4	1
Occurrence of term, Public	4	1
Occurrence of term, Professional	1	0
Occurrence of term, Delivery	1	0
Occurrence of term, Recital	0	1
Total	10	3

This does not include the miscellaneous list where such terms as Recitals, Platform Art, Evening Programs, Program Making, and Dramatic Art occur

We have now reached the term, Interpretative Reading which we found more used than any other title,—seventeen times for college courses and four times for normal schools.

	Colleges	Normal Schools
Interpretative Reading	17	4

The unfortunate connotation earlier referred to concerning the word, Reading, is done away with by the qualification, Interpretative. The Speech work studied is Reading to be sure but it is good reading expressive reading, meaningful Reading—Interpretative Reading.

This term as we have seen is most generally used and has obvious advantages. Clarification of aim and content of courses thus titled is the need in this branch of the field of Speech, and it is toward this end that our study is made.

A SELECTED BIBLIOGRAPHY OF AMERICAN ORATORY*

Compiled by ALBERT CRAIG BAIRD
University of Iowa

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EDITORIAL

THE RESEARCH NUMBER

IN this number the Committee on Publication of Research Studies, appointed at the 1925 convention, offers its first contribution to the literature of Speech Education. Two major studies, both doctors' theses, have been selected to appear under Committee auspices; they will be found on pages 243 to 333, and each will also be reprinted separately.

The Committee has not found its task a simple one. Many studies have been submitted, most of them showing some merit but very few being in shape for immediate publication. A great deal of time has been required for shipping these about the country and for assembling the comments and criticisms of the widely separated committeemen, with the result that some very interesting papers, doubtless quite worthy of publication, have not yet been finally acted upon. In some instances the criticisms and opinions have been conflicting, and since the Committee has held no meeting there has been no opportunity to thrash them out.

The two papers here published are the only ones upon which it has been possible so far to secure concerted action. Both were unanimously approved. Neither has been subjected to editorial revision, either by the Committee or by the Editor of the JOURNAL. Each member of the Committee offered such comments and suggestions as occurred to him, but the final revision in each case has been left to the author himself, as has the proof-reading. In other words the Committee has acted as a jury and as a board of advisers, but in no sense as an editorial board; and the Editor has kept hands off.

Whether this procedure represents the intent of the motion by which the Committee came into being is a question that will have to be settled at the 1926 convention, but it is the only one that has proved feasible this year. Meanwhile the important mat-

ter has been to get the two leading studies into print, for both of them are thoroughly original and represent genuine contributions to the methodolgy and to the subject-matter of speech science.

THE NEW DIRECTORY

FOR the reason that the June number was a little late, some of our members doubtless missed the announcement concerning the National Directory of Teachers of Speech. To insure the inclusion of every name that properly belongs in this directory we are reprinting the registration blank and holding the copy open for just ten days after this number goes into the mails. Will your name be left out?

See page 396.

THE FORUM

[EDITOR'S NOTE: Letters for the FORUM should be direct and concise. They may be upon any topic in Speech Education, controversial or otherwise; but publication is not to be regarded as editorial endorsement, either as to form or as to content.]

A TIRADE IN THE FAMILY CIRCLE

To the Editor of THE QUARTERLY JOURNAL OF SPEECH EDUCATION:

Dear Sir—Conducting a summer course in the Teaching of Public Speaking raises some very interesting questions as well as some rather humiliating reflections about our profession. Students who compose such classes are generally high school teachers of some maturity and experience. They have minds of their own, and are quite competent to take the measure of their professors. It is to be feared that they sometimes reach conclusions complimentary neither to our professional competency, our good sense, nor our honesty.

For instance, they often seek light on such matters as the physics and physiology of voice production. It is the lamentable truth that to find in recent texts by professors of Speech any treatment of these matters that is either accurate or clear is nearly impossible. In rhetoric, in interpretation, in phonetics, in play production, much of what we teach is of necessity matter of opinion. But where we overlap the fields of physics and physiology we are privileged to build upon the solid ground of science. And what a mess we make of our instruction here. For example, on so definite and simple a matter as respiration one finds in our recent texts such gems as these: "In diaphragmatic breathing the diaphragm contracts, moves downward, while at the same time the abdominal muscles expand the lower chest laterally." Another text copies the same sentence exactly (and gives no credit for lifting it). Another says that to the muscles of the abdomen the diaphragm is attached, "and when they pull hard, more power is

given to the diaphragm. Try it and see. . . . This is real *abdominal breathing.*" Another says that in uttering a word "if the work is done correctly an outward pressure will be felt below the sternum." Another says that as you blow out your breath "the diaphragm will harden, expand, and become elastically taut;" it will "grow hard as you expel air from your lungs. If the student learns what his diaphragm is," etc. He will hardly learn from this professor. Another instructs the student to "drive the air out making sure to use the diaphragm for motive power." Perhaps information about the breathing process is not valuable in our work. But whether valuable or not, if we present it to our students we ought to present it accurately. The facts are not difficult of access. They can be got in ten minutes from any physician or any text on physiology. If we care so little for accuracy we can hardly hope to be respected by our colleagues in other fields —or by keen minded young teachers who sometimes come to summer school.

These same teachers report that they are expected to prepare students for oratorical contests. They come to us for clarification of objectives and instruction in methods. Dare we tell them that there is no agreement among the professors as to what constitutes good oratory? and even less among the judges whom we allow to pick the winners in our contests? Oratorical contests are won precisely as games of dice are won—by chance. Yet we encourage boys to enter these contests assuming that merit wins, and that our particular standard of good speaking is known and accepted by the other candidates and by the judges. Our procedure is just as silly as turning a group of athletes loose on a field and asking each to do his best stunt, without bothering to instruct them and the judges as to whether the event is a shot put, a wrestling match, or a broad jump. Suppose sometime one of our victims should begin to think for himself and say, "I did the kind of speaking you coached me to do—did it better than any other contestant, as you admit. Why didn't I get the prize?" And what shall we say to the poor high school teachers who have just been through an orgy of oratory on the Constitution and are bewildered by the results? I fear they cannot learn much from us. Most of us are not only permitting but actively fostering contests in which speakers and judges work in the dark, neither knowing

what the other may deem the bases of excellence. If we cannot or will not come to an agreement on what constitutes good oratory, we ought to cease holding such contests; for we are allowing our students and the public to believe that the objectives are known, and that merit wins.

Of contest debating much the same may be said. But that is not the heaviest charge to be laid against the profession in their fostering of this major sport. One would suppose that professional men intrusted with the training of youth for public discussion would feel responsible for the moral as well as the intellectual development of their charges, and would not surrender themselves to the game spirit and seek only to accumulate victories, at whatever cost. Yet some of us have so surrendered. During the season just ended, during which our teams took part in thirty-six contests with other schools, we discovered some curious practices. One coach directed a boy in the preparation of an argument which though plausible was utterly fallacious because of its skillful misuse of statistics, as the boy was proud to explain afterward. Another built a case that was purely an appeal to local prejudice, ignoring entirely the real significance of the question to the country at large. Others allowed their speakers to invent authorities on the platform, and seemed proud of their resourcefulness. Another gathered private letters from all over the country in reply to a questionnaire, found that they favored one side of the question as much as the other, and so quoted on each side the testimonies that favored that side, avoiding all mention of the contrary testimonies, and claiming on both sides that the letters furnished incontrovertible proof. And of course worse things than these are done. If debating is training for public discussion it ought to be training for *honest* public discussion. Surely an open debate sponsored by university professors of Public Speaking ought to represent an honest attempt to get at the truth on public questions. What then shall we say to high school teachers seeking advice concerning the conduct of debating? Are we willing that they imitate our practices? And what has our profession to say to the occasional debater who happens to carry a conscience along with his forensic ability?

Other professions, of course, are sometimes guilty of unprofessional conduct; but if we value our integrity and our good name,

we might better seek inspiration from their virtues than consolation from their vices.

Very truly yours,

W. M. PARRISH,
University of Pittsburgh

HIGH SCHOOL DECLAMATION

To the Editor of THE QUARTERLY JOURNAL OF SPEECH EDUCATION:

Dear Sir—Once more we are entering upon the declamatory season; and once more we look back over past years, and tremble. What is wrong with our contests? Of course, it is much easier to be destructive than to be constructive, but let us try to be both for a few lines.

There is a great deal the matter with our attitude toward declamatory work. Most of us—parents, teachers, and pupils—think of the contest as a means of winning a decision, as a chance to appear before the public. Mother says, "Alice might just as well go out for declam, for she'll need a new dress about that time anyway." The family think that Junior should "try out," for the Smith boy did last year, and he won a trip to the next contest. The medal on his watch chain is good-looking, too, and may help him make a frat when he goes to college. And so, from all the homes in the community they come—sixty strong for the preliminaries.

To the teacher, or coach, goes all our sympathy. She *must* produce winners. She may have splendid ideals resulting from years of study and thought and observation; but because the school and town demand decision and applause, she urges the children to work for effects. She selects "showy pieces" which allow much position, movement, and gesture—very much gesture. Then she, or perhaps a "trainer" from a nearby city or college, takes charge. I say "trainer" advisedly. Into one's mind flashes a picture of a circus lot; in the lion's cage stands a man who puts the animals through their tricks. Just so does our declamatory director prepare her contestants for the public performance.

Work begins, and the child becomes a little automaton. If some one points his finger at him and gives him his cue, he will begin his stunt and continue to the tragic end, even though his knees shake, his voice quivers, and his breath comes in gasps. The

trainer is certain that he will do just what he has been taught to do, for that is all he knows; he can not do anything else. In a district contest last winter, a lad found himself on a loose board. As he gently swayed from side to side, the board emitted a rhythmic squeak-squeak. The orator noticed it. A bright red spot appeared on each cheek. As the sounds from the board continued, the red spots grew larger and larger, until they covered even his neck. His face and hands told of his embarrassment, but the words poured forth. At last came the sentence on which he had been trained to step. With an almost audible sigh the sufferer got off the board and continued his oration.

For fear of being misunderstood, we repeat: to the teacher or director goes all our sympathy, for she is helpless. She is praised for producing winners. Only a very few people in the town discuss the ideals which she gives the pupils, the development of personality, and the real thought work of the contest.

The greatest responsibility for our trouble may be laid on the judges, or on the selection of judges. Three judges sit through a contest and hand in three different decisions. They have disagreed widely on every speaker. Ask them what they considered in forming their decisions. One will say "voice," and another say "gestures." Have you ever heard three judges talking about excellent presentation of thought and sympathy? You may know of one who has judged on thought but who lost his decision to the other two. Why not engage judges who have had experience in speech? A minister may be a big influence for good in his community, may be a splendid preacher, and may be, therefore, capable of judging the contestants in oratory, but not qualified to vote on dramatic and humorous readings. Not all superintendents, English teachers, and lawyers are good critics of declamatory work.

But we must be constructive. Here is one plan that worked: In the fall a new teacher went into a certain high school. The superintendent gave her a complete schedule in English. When he saw that she was greatly interested in speech, he told her that she might present her work for the approval of the pupils for second semester. As a result of her talk in assembly one morning, forty Juniors and Seniors enrolled for public speaking.

During the winter and spring, instead of having contests, this instructor presented in recital all pupils who were willing to ap-

pear. She did not have to train the forty would-be readers and orators for a home contest. She gave in regular class periods the fundamentals of good speech and gradually worked up to a finished production from each pupil—an attractive selection which could be used on programs. To the children who appeared often at church entertainments she gave reading suitable for such gatherings. To those whose parents were active in clubs she gave selections which they could use. Always she emphasized the fact that oratory and dramatic reading were merely means of conveying worth-while thought, never a means of showing off.

At the end of the term came the recitals. Each number was the result of class work and intensive final practice. Townspeople came to the series of programs. Every parent was happy. He knew his child had done best. All his friends said so, and nobody else talked to him about it.

The instructor chose her best reader to represent the school in the district contest. Perhaps a few people complained, but an overwhelming majority were so pleased with the recitals that the results were more than satisfactory.

This is one plan that worked. There are many others. Why not try one which *may succeed?* We know the one now in general use is a failure.

Our salvation is in correct ideals of speech. Let vocal expression be what Carlyle says it should be: "The tangible sign of what other faculties the man had in the silent state," and let his purpose be "not so much that he should possess the art of speech, as that he should have something to say." Voice and bodily expression—all the mechanics of speech are of *great* importance, but only as means of conveying thought. Voice and gestures may prejudice an audience for or against the thought. For this reason they must be emphasized, but not as an end in themselves. A college instructor remarked the other day that if people didn't change their ideas about declamation, did not stop making gesture all-important, we should be obliged to move down into the gymnasium. A big husky boy would be insulted if asked to register for aesthetic dancing, yet on a certain contest this winter a lad gave "America's Unknown Dead" with all the bodily action of a dancer doing an interpretative dance. All he lacked was the foot movement. A few persons who listened to him wondered if the child ever had

thought of how President Harding would "talk to" an audience. In many small towns truly great speakers never appear, but the instructors have heard them. Why do they not pass on high ideals to their pupils?

Let the pupils talk about something which they can understand. Not long ago Percival selected an oration. It was something about why we are engaged in the World War. Percival was just sixteen and did not stop to think whether we were at war or not. It sounded good anyway. It began "Mr. President and Fellow Senators." The President was not there; so Percival addressed the right hand radiator and then located the senators on the floor below the platform. Each evening after school he launched into an exposition mechanical as the clock which was ringing the gongs at the close of each class period. How could we expect him to put real thought and feeling into a subject about which he had had no experience?

Dorothea "spoke a piece" entitled "To Have and to Hold." In her wildest dreams she could not imagine such circumstances or situations; so she became a superficial copy of her trainer, using her original thinking for her new dress and boyish bob.

But "America's Unknown Dead" won. Yes, that is true. It did win. It won because two judges were excellent English teacher and school superintendent respectively, but had no understanding of declamatory work.

Let us try to improve the general attitude toward speech. Let us influence our teachers to impart ideals to the pupils and to vote for competent judges. To do this let us pursue the method which, according to Edward Alsworth Ross of Wisconsin University, will most quickly bring about a reform—"A discussion that attracts general attention finds its natural issue in a state of public (or social) opinion." Let us discuss.

Very truly yours,
LOIS JEAN GILLAM,
Iowa State Teachers College

ASSOCIATION NEWS

THE ELEVENTH ANNUAL CONVENTION

The Palmer House in Chicago
December 28, 29, 30

A MESSAGE FROM THE PRESIDENT

Preliminary announcements for the Eleventh Annual Convention of the NATIONAL ASSOCIATION OF TEACHERS OF SPEECH will soon be sent to all members. The meetings will be held at the Palmer House in Chicago on December 28, 29, and 30, 1926. Professor Clarence T. Simon of Northwestern University will serve as chairman of the committee on local arrangements. Accommodations better than we have had before are assured by the management. Members of the Association are requested to reserve rooms at the Palmer House if possible. If reservations are made early, rooms at reasonable rates can be secured. Further information pertaining to rooms and railroad transportation will be included in the preliminary announcement.

Although the program is still in the process of organization, we are assured of three interesting days. General sessions will appeal to all members of the ASSOCIATION. Among the speakers will be Professor Frank N. Rarig of the University of Minnesota, Professor Edward Sapir of the University of Chicago, Dr. Milton Metfessel of the University of Iowa, and Professor John Muyskens of the University of Michigan. In planning the general sessions I hope we shall be able to include discussions by leaders in each of the fields of activity represented in the ASSOCIATION.

Special sessions will discuss the following topics: Speech Correction, The Use of the Laboratory and the Use of Educational Tests and Measurements in the Teaching of Speech, and Teaching of Phonetics. For those who are interested in rhetoric, oratory, argumentation and debate, sessions will be provided to discuss Oral

Style, Teaching of Speech Composition, The Improvement of Oratorical Contests, the Method and Function of the Critic Judge, and the Problem of Analysis and Issues in Debate. Those interested in reading and in dramatic art will find discussions of the Teaching of Acting, Organization and Conduct of Play Production Contests, Theatre and Stage Construction and the Curriculum in Theatre Arts.

The topics are being so selected and the sessions so organized that high school teachers will find a series of meetings of special value to them each day of the conference. In addition, a definite part of the program will be devoted entirely to the discussion of their problems. Teachers in colleges and normal schools will be interested in a similar series of meetings, with one main session devoted to the organization of courses for the small college. This arrangement of the program will provide sessions which will appeal to all members during the three days.

The dinner session for the consideration of problems of graduate study will be held on Wednesday evening, December 29th. Professor Herbert Wichelns of Cornell University will be chairman of that session. The Advisory Council will meet on Monday evening, December 27th at the Palmer House.

Will you please coöperate with Professor H. L. Ewbank and with the members of the committee on membership by extending an invitation to join the NATIONAL ASSOCIATION to all of your colleagues and to those in your immediate vicinity who are not members?

We are planning a program which will appeal to the entire membership and which will make it genuinely worth while to come to Chicago for the convention. If you have suggestions will you please write to me so that I may, if possible, include them in the revision of the program for its final edition.

E. C. MABIE

NEW BOOKS

Studies in Rhetoric and Public Speaking in Honor of James Albert Winans. By PUPILS AND COLLEAGUES. New York, The Century Co., 1925. Octavo Cloth. Pp. 299.

The volume in hand is a collection of eleven papers on important subjects in the field of speech written by pupils and colleagues of Professor Winans at Cornell University, and offered to the world with the following dedication:

"To

JAMES ALBERT WINANS

upon his completion of a quarter of a century of teaching, during which period, by his work in college classrooms, by his writings, and by his personal qualities, he has exercised a beneficent leadership in the field of academic instruction in public speaking, this book is offered by his pupils and colleagues."

The appearance of this volume is a very significant event in the history of the profession to which THE QUARTERLY JOURNAL is devoted.

The work is of great professional interest, first, because we have not had anything like it before. It is not a textbook, but a volume of scholarly papers for the teachers and scholars of the profession. Not that I wish to decry textbooks; but even so, it is refreshing to pick up a large and beautiful and expensive volume of professional writing that is not offered as a textbook for regular classes.

It is edited by Professor A. M. Drummond of Cornell. In scope and in detail, in the material covered and in the technique of scholarly writing, in content and form, it represents a genuine editorial achievement—Professor Drummond's second, it will be remembered, within two years.

As a profession, we are indebted to the editor and the authors, to Cornell University, and to the Century Company for making the contribution in energy and time and money which this enter-

prize required. We thank them all and trust that somewhere, somehow, they will all be amply rewarded for this service.

This book is significant for its own peculiar contribution to the better understanding of certain problems in the field of speech; but it is equally significant for the use which can be made of it as a collection of type studies or models to which ambitious students may be referred. At this time when there seems to be a new and widespread interest in advanced study, graduate work, and research in this field, this volume will add to many situations the much needed examples of good workmanship—the more persuasive examples in many cases, in that they are the products of contemporaries who are professionally at work in this field. There is a pedagogical force in referring a graduate student today to Hudson's article on *DeQuincey on Rhetoric and Public Speaking*, or to Wichelns' *Literary Criticism of Oratory* that cannot be obtained by referring the same student to Masson, Newman, Taine, Gosse, Trevelyan, and the others to whom Hudson and Wichelns refer. I suspect that frequently in conversations between graduate students and professors in this field, the professor will slip into his conversation (with the air of one who has read and evaluated all relevant material) "for instance, the sort of thing that Caplan did in translating that medieval treatise on preaching," or "to get an idea of exactly what I have in mind, see Wichelns' discussion of Literary Criticism of Oratory." Or the professor may say: "I should like you to take this subject and present to the seminar before the end of the year such a paper as Hunt's on Plato and Aristotle." But the professor won't really mean this last, of course, unless the graduate student in question is a very industrious, very well prepared, and very intelligent graduate student—or (God forbid) the professor is a very dull professor.

The volume covers an impressive range of subject matter, from the rhetorical theories of Plato and Aristotle, through medieval preaching, literary criticism, the contributions of individual writers—as Bacon and DeQuincey, the psychology of argumentation, to stuttering, and phonetics. It also contains an illuminating variety of treatment from the easy, timely, undocumented, almost personal exposition of Dr. and Mrs. Blanton; the careful discussion of a single aspect of the work of a many sided historical character—as Hudson on DeQuincey and Hannah on Bacon; the

translation of an important medieval document with interesting and scholarly introduction and editing—as Caplan's article on medieval preaching; to the very careful, comprehensive, interesting, and scholarly comparison of two of the ancient great ones—as Hunt on Plato and Aristotle. Certainly no other single volume in existence can offer to the advanced students in speech in the univesrities of this country so many and such compelling challenges which are at the same time friendly and illuminating models.

I suppose it is inevitable that eleven separate articles on a wide range of subjects should not appear equally meritorious in the eyes of any single reviewer, and the present situation presents no exception to the inevitable rule. For the reasons that I have already given or suggested, I rate the articles on *Plato and Aristotle on Rhetoric and Rhetoricians,* by Everett Lee Hunt; *A Late* and *Medieval Tractate on Preaching,* by Harry Caplan; *Literary Criticism of Rhetoric and Oratory,* by Herbert A. Wichelns as outstanding contributions and pre-eminent examples of interesting and scholarly additions to the literature of our field. *DeQuincey on Rhetoric and Public Speaking,* by H. H. Hudson; *Francis Bacon, the Political Orator* by Robert Hannah; *Phonetics and Elocution* by L. S. Hultzen; *Stuttering,* by Smiley Blanton; and *Speech Defects Other than Stuttering* by Margaret Gray Blanton, I rate as substantial but less brilliant achievements than the above mentioned three. These five writers undertook simpler tasks. Each task is, in my opinion, decidedly well done. Let us give them *"magna cum laude,"* but not *"summa cum laude."*

The other three articles do not satisfy me so well. Each one leaves me with a feeling of inadequacy of treatment. Of the three, I regard most highly that on *A Psychological View of Argumentation* by Wm. E. Utterback, but this is either too long or too short—too long for what it does; too short for what its title calls for.

This article seems essentially to do little more than state the rather easy parallel between the three rhetorical terms: (1) statement of the proposition; (2) constructive argument; (3) refutation, and the three steps in the process involved in inducing belief according to an amplified statement of James' position that "an idea that prevails stably in the focus of attention is believed"; viz., (1) "calling the idea to be accepted into the conscious mind of the

hearer; (2) connecting that idea with conceptual systems from which it can derive sufficient emotional energy to maintain it in the field of attention; and (3) the disposal of inhibitory ideas." This parallelism is stated and restated with, of course, an explanation of what the writer means by conceptual system, emotional energy, inhibitory idea, etc. This simple task could be accomplished in a very much briefer space than that taken by this article.

As a psychological view of argumentation, this essay is quite disappointing. There is a lack of clearness at the outset. It purports to be an examination of "the psychological basis of that portion of rhetoric usually discussed under the head of 'argumentation'." Argumentation is defined as the art of convincing others by reasoned discourse. Immediately the reader wonders whether or not Professor Utterback is going to consider only argumentation in types of situations involving what used to be called "conviction," and exclude argumentation in types of situations involving what used to be called "persuasion." One wonders whether or not he wishes to treat argumentation as *the art of influencing others (through the medium of reasoned discourse) to believe what you want them to believe,* and to exclude from his discussion any consideration of argumentation as *the art of influencing others (throug the medium of reasoned discourse) to act as you want them to act*—or, if you prefer—*to do what you want them to do.* This difficulty is not cleared up. True the word "persuasion" is conspicuously absent from his introductory paragraphs, and "acceptance" seems to be the keyword, used to designate the sort of result at which the argument he has in mind always aims. He says: "Let belief be the momentary acceptance of an idea which is at the time in the field of consciousness; and let conviction be that predisposition which determines that "when an idea enters the mind it will bring with it the state of belief. A conviction is thus a potential, or quiescent, belief." In the same paragraph he says: "We wish to exclude these rhetorical methods (the use of suggestion and emotional appeal) from the scope of this paper." At the end of this paragraph the reader is ready to proceed on the assumption that Professor Utterback is concerned here with types of argumentation whose end is "acceptance," which have commonly been called cases of conviction, and is not concerned here with types of cases whose end is the control of human activity—doing, gross action, overt behavior—which have commonly been called "persua-

sion." But this is not clearly stated, and so one passes through this part of the essay in some doubt as to whether Professor Utterback believes in a very great difference or a substantial identity between our old friends conviction and persuasion. The history of "that portion of rhetoric usually discussed under the head of argumentation," being what it is, any article on the psychological view of argumentation should, in my opinion, bring these two terms at once "into the focus of attenttion," and should deal with them explicitly in whatever way suits the writer's purpose. To pass them over, or to walk around them, or in any way to omit to stir them up, seems to me a bit like discussing prohibition in 1926 without mentioning the 18th Amendment or the Volstead Act. Confusion is somewhat increased later in the article, when, in spite of the exclusion above quoted, Professor Utterback brings in considerations of emotional energy and emotional intensity. He says on page 287: "The first condition (of that persistent stability which constitutes belief) is that the idea must suggest a very considerable emotional intensity. An emotionally colorless idea will not prevail stably in the focus of attention." The function of emotion in argument seems to be both excluded and included.

My second general criticism of this article is obviously vitally related to the first. It is that the beliefs dealt with seem to be the beliefs of Robots, or complicated machines, to be operated something in the manner of cash registers or bank vaults, instead of the beliefs of human beings. Had Professor Utterback not originally limited his discussion as he did, doubtless he would have given more of an impression that the argumentation he is discussing is argumentation among and between complete humans.

Finally, after having been reminded on the first page that there is "a growing conviction that recent developments in psychology make it possible and desirable to undertake again the restatement of basic rhetorical theory," it is somewhat disappointing to find that the most important works on psychology to which any reference is made are James, 1890 and Pillsbury, 1910. Others used are Hume, 1882; Bain, 1880; and Scott, 1907. The most recent one is dated 1910. One feels that in such a discussion some of the more recent psychologists—such as Woodworth, Allport, Watson, Smith and Guthrie—are at least entitled to the courtesy of a crack on the head.

I am disappointed in Professor Parrish's artile on *The Rhythm of Oratorical Prose.* Its *raison d'etre* is not sufficiently clear. Quotations and more quotations are offered from various writers and brief comments are made upon them, but they do not seem sufficiently to be used as grist for the mill of Mr. Parrish. The purpose is clearly stated in the opening paragraph: "This paper will attempt to synthesize from these varied materials and viewpoints a coherent explanation of the nature and function of rhythm in spoken discourse." This synthesis eludes me after careful reading, rereading, and review.

The second paragraph from the end opens with this sentence: "A final word may be added concerning the place and function of rhythm in prose," and in the last two paragraphs Herbert Spencer, Longinus, Lipsky, Bulwer-Lytton, Professor Cabot, Saintsbury, and Gummere are placed upon the stand, but very little if any significance seems to have been brought forth on the place and function of rhythm in prose. In the remarks made or quoted here in regard to rhythm, there seem to be no suggestions concerning which there exists any difference of opinion, unless it be the wholly unsubstantiated suggestion that speech rhythm is "inappropriate and frequently a cause for suspicion in a speech whose aim is the communication of ideas." There follows Longinus' statement that an "over-rhythmical passage does not affect the hearer by the meaning of words, but merely by their cadence." But this even if one could grant it full force and effect (which I cannot, and which Professor Parrish does not in any way establish), is after all a warning in regard to over-rhythmical passages and not rhythmical passages. It is further stated that "rhythm alone does not make distinguished prose," which I trust no one will be disposed to question. The final conclusion that "in this purely auxiliary capacity it does add greatly to distinction in style, much more to spoken than to written style," may or may not be accepted at its face value. I can, however, find nothing in this essay to substantiate this conclusion, and it seems quite inconsistent with the statement in the preceding paragraph that it (speech rhythm) "is inappropriate and frequently the cause for suspicion in a speech whose aim is the communication of ideas"—unless one is disposed to take the very doubtful ground that distinction in style is inappropriate in a speech whose aim is the communication of ideas.

So much for the beginning and end of the essay—for the promise and the fulfillment of the purpose. A word should be said in regard to the body of the discussion. It is made up almost wholly of a very large number of quotations with too brief and too disorganized comment upon them. The point at which the author most clearly states his own position is at the top of page 219, and here I find myself thoroughly unable to agree. In preparing for his definition of oratorical prose rhythm, he says: "In oratory we can consider only regularity *in time*. Some forms of verse make an appeal to the eye through a regularity in arrangement on the page, but the appeal of oratorical prose is to the ear only and hence is to be considered as regularity in time." This suggestion seems to me entirely superficial. That rhythm in poetry may be a matter *of space* arrangement of the word symbols upon a printed page, to be achieved by a journeyman printer, rather than a matter of inherent meter and accent in the lines of the poet as they are (or are to be) spoken, seems to me an idea which crept into this essay only through carelessness.

Next we get Professor Parrish's definition itself: "Let us say, then, that for this essay oratorical prose rhythm is defined as *a rhetorical device which consists of effects repeated at regular intervals in time, and is intended to give distinction to style or pleasure to the audience.*" I am somewhat puzzled by the phrase: "a rhetorical device which consists of effects," and have been unable to discover why the qualification "which consists of effects" was included in this definition. In the next paragraph the writer says that "there are legitimate rhetorical devices which give pleasure and distinction which do not come under this definition." It is obvious, then, I suppose, that the heart of the definition is "rhetorical devices repeated at regular intervals in time." Having arrived at this point, I asked myself this question: If at regular intervals of fifteen minutes through a speech which is an hour and a half long the speaker repeats the rhetorical device (for the purpose of giving distinction or pleasure) of telling a humorous personal reminiscence, does this constitute an example of oratorical prose rhythm? If not, then this is clearly a poor definition; and if so, then this essay apparently does not even attempt to give a synthesis of the nature and function of any complete conception of prose rhythm.

At this point in the preparation of this review, it occurred to me that it is much easier to pick flaws in the definition of such a term as rhythm than it is to phrase a satisfactory definition, and I tried my hand at making one myself. Perhaps Professor Parrish or some other reader of the QUARTERLY will be happy to point out how very inadequate this definition of mine is. This is it: "Prose rhythm consists of discernible, but not rigidly metrical, recurrence of accent patterns."

The article on *Emerson and Oral Discourse* by T. T. Stenberg is in rather devastating company. When measured by any yard stick that one could think of applying to the other articles in this volume, this essay on Emerson is left in a very unhappy position. On reading this article after reading the articles by Hunt, Caplan, and Wichelns, and particularly the one by Hudson (since this one is a parallel in type—namely, *DeQuincey on Rhetoric and Public Speaking*) immediately preceding it, one feels a decided let down.

Of course it can be said with considerable justice that Messrs. Utterback, Parrish, and Stenberg are subjected to a very severe test in being compared with the best that Hunt, Hudson, Caplan, and Wichelns have ever published. Granted. But this is a comparison which they seem to have made inevitable by contributing to this volume—one which any reviewer must perforce make and publish.

The article on Emerson is not entitled to a place in this distinguished collection. In the selection of the material from Emerson's work, in the author's thinking about and through that material, and in matters of organization and composition, this article is unsatisfactory. Part I is a simple account of the quite ordinary development of Emerson's interest in oral discourse. Part II is a collection of comments on Emerson's speaking taken from his contemporaries. These parts comprise roughly one-third of the essay. The main part of the paper is Part III (which is devoted to Emerson's contribution to the study and practice of public speaking.) Here, if anywhere, is to be found the wheat in this bushel of quotations. I found none. If this is a true exposition of Emerson's contribution to the study and practice of public speaking, that contribution can be fully expressed in one sentence: He didn't make any.

Phrases from Emerson are quoted by the handful without adequate reference to their contexts, or adequate interpretation by

Mr. Stenberg. Vague, ambiguous aphorisms are presented with nothing to diminish the vagueness, and no hint as to how Mr. Stenberg would resolve the ambiguity. The following paragraph may be offered here as being thoroughly typical and brief enough for quotation:

> "Do not expect to be always understood or appreciated. 'It is a luxury to be understood.' 'Those who live to the future must always appear selfish to those who live to the present.' 'Man was made for conflict, not for rest.' 'The true and finished man is ever alone.' 'Magnanimity consists in scorning a circumstance.' 'God is not in a hurry'."

To whom Mr. Stenberg gives the advice "Do not expect to be always understood or appreciated" does not appear. It seems difficult to believe that Mr. Stenberg thinks that anyone actually expects to be always understood or appreciated, or that Emerson ever thought that. The article contains paragraph after paragraph of which this is a perfect type. Mr. Stenberg's topic sentences usually express the obvious commonplaces of the most unlearned and uncritical of commentators on public speaking. That there are phrases to be gleaned from Emerson's writings which can be more or less loosely related to these commonplaces, seems to me a matter of very small moment. The same thing can be done, I venture, with the writings of any one who has written very much and who has had any interest in public speaking.

In phrasing and organizing the topic sentences under which Mr. Stenberg groups the quotations from Emerson, he makes no distinction between Emerson's rhetorical doctrine and his casual comment—between topics that aim to teach rhetoric and those that are simply remarks about rhetoric. Some of the sentences are phrased in figurative language and left quite uninterpreted. For instance, on page 170: "The orator should speak things, not words." In so far as the quotations from Emerson grouped under this heading throw any light on its meaning, it apparently has one or the other of two quite distinct meanings—viz., that the orator should be sincere, or that the orator should adapt his speech to the understanding and feeling of those listening to him. There is no hint as to which is meant, and both of these concepts are covered in other paragraphs, as for instance on page 166: "speak from your inmost soul," and on page 178: "take the occasion into

account," and on the same page: "practice what you preach." The topics are repetitious as well as vague and figurative.

Typical examples of quotations from Emerson without any contextual treatment to relieve their ambiguity or even, in cases, to make them seem intelligible, consistent, or possibly true, are the following: "To believe your own thought, that is genius." "Use what language you will, you can never say anything but what you are." "Nothing can compensate for want of belief; no accomplishments, no talents." "That which we do not believe we cannot adequately say, though we may repeat th ewords ever so often." "Though your views are in straight antagonism to theirs, assume an identity of sentiment, assume that you are saying precisely that which all think, and in the flow of wit and love roll out your paradoxes in solid column, with not the infirmity of a doubt. So at least shall you get an adequate deliverance.... But assume a consent and it shall be granted, since really and underneath their external diversities, all men are of one heart and mind." "Also, I believe that nothing can be done except by inspiration." "Knowledge is the only elegance." "The orator should speak things, not words." "Omit all the negative propositions." "An affirmative talent is always safe. The critics may do their worst; it is victory."

In spite of the deficiencies which seem to me to mar three of the eleven articles in this book, the final and total impression which I get from it, and which I think it will make wherever it is carefully read, is one of distinguished achievement. It is an honor to our profession and a very great honor to the group whose work it is. In welcoming it as perhaps the most significant volume offered to workers in the field of speech in a very, very long time, hundreds of members of our profession will get increased pleasure from the fact that it is specifically dedicated to one who holds such a place in the esteem and personal affections of the members of this profession as is held by Professor Winans. We shall admire it greatly for its own qualities; we shall delight in it because it is done in honor of Winans.

J. M. O'NEILL, *University of Wisconsin.*

Modern Speeches. Edited by HOMER D. LINDGREN. New York. F. S Crofts & Co. 1926. Pp. iv + 506.

This collection differs somewhat from the usual book of

models. The chief point of emphasis is the distinction between the speech proper and the written essay read or spoken to an audience. The whole compilation is built about the doctrine of a "lively sense of communication." Without condemning the essay type as altogether useless, the editor seeks to show its limitations and to impress the student with the importance of direct contact with the audience.

To this end he groups the speeches under four headings, as follows:

I. Written papers which have been read to an audience manifestly interested in a particular subect.

II. Written papers delivered by a great personality and interesting because written or spoken by that person.

III. Speeches that combine complete rhetorical preparation with a sense of the presence of the audience.

IV. Speeches that are clearly in touch with the audience throughout.

The collection includes sixty-one speeches, nearly all of them delivered since 1920. They cover a wide range of topic, and represent many types of speakers, most of them very well known. But whereas most collections contain—or are supposed to contain—only good speeches, this one purports to include both good and bad. One may perhaps infer that the bad ones are to be found chiefly in groups I and II, but the editor carefully refrains from identifying them—a measure of safety, no doubt, since many of the authors are still living, and some of them quite healthy and vigorous. He merely invites the instructor to make use of the collection as a basis of contrast and criticism rather than imitation. The plan presents obvious difficulties, but one is tempted to give it a trial.

JOHN DOLMAN, JR., *University of Pennsylvania*

Famous American Jury Speeches. By FREDERICK C. HICKS. West Publishing Co., St. Paul, 1925. Pp. 1181.

Twenty-four forensic speeches drawn from the last forty years of American jurisprudence, accompanied by excellent biographical notes and full of explanatory comments, constitute a real contribution on the part of Mr. Hicks. Among the names of the speakers are most of the really famous trial lawyers of our times, and many better known in other pursuits, such as Joseph H. Choate, Robert G. Ingersoll, Francis L. Wellman, William E.

Borah, Peter F. Dunne, Martin W. Littleton, Morris Hillquit, Clarence S. Darrow, and Robert E. Crowe.

The title "Jury Speeches" is hardly accurate. As Mr. Wellman explains, only "twelve of the speeches were delivered to juries; six were before courts, without juries, sitting in admiralty, criminal law, equity, and probate; four were before legislative investigating commissions; and two were in a court of impeachment.

Mr. Hicks, who is Associate Professor of Legal Bibliography and Law Librarian of Columbia University, has done his task well. The selection is catholic and generally reflects good judgment. The biographical notes and comments are full, definite, satisfying. The book itself is not unwieldy, and is admirably printed and beautifully bound.

Two or three speeches are particularly interesting and especially useful to the teacher of argument and persuasion. One of these is Francis L. Wellman's "Summation for the People in the Carlyle Harris Murder Trial." A more masterly handling of circumstantial evidence, a more adroit appeal to emotions, a more effective conclusion, have not come to the reviewer's attention this side of Webster. The Darrow-Crowe speeches, strangely enough, have not lost their interest with the waning of publicity concerning the Loeb-Leopold trial, and will probably retain it at least during this generation.

No such source book for students of debate and conviction has appeared in our times. So valuable is it that it is not inconceivable that advanced classes in argumentation will be using it as a text. The average reader will find it as interesting as most modern novels; it is a collection of judicial oratory which one would delight to own.

RUSSELL H. WAGNER, *Cornell University*

Negro Orators and Their Orations. By CARTER G. WOODSON. Associate Publishers, Inc., Washington, D. C., 1925. Pp. 711.

Students of persuasion and, to no less extent, students of the racial problem in the United States should feel grateful to Mr. Woodson for this significant collection of negro orations, which to the best knowledge of the reviewer, is the only first-rate work of its kind. Seventy-four orations, roughly covering the negro problem from the Colonial period to the present day, no matter how

edited or arranged cannot fail to be a contribution to the literature of oratory. And the editor of the volume, who is a widely known negro editor and author, has in many respects performed well what must have been a real "labor of love."

As the editor explains in the "Foreward," the plan of the book is to present "practically all of the extant speeches of consequence delivered by Negroes in the United States" so that they may be of value to persons studying (1) the development of the Negro in his use of a modern idiom and (2) the history of the race. A very brief (and futile) chapter discussing oratory in general and the ability of the negro in it constitutes the introduction. Twelve chapters covering periods of negro oratory in chronological order follow.

True to his purpose, the editor includes selections from all great negro orators—Charles L. Remond and Frederick Douglass being represented by the greatest number of speeches. The absence of W. E. B. Du Bois is perhaps to be accounted for by the editor's assertion that Du Bois is purely an essayist. This dictum, in which we cannot concur, may give some index to Mr. Woodson's views on public speaking. Very confusing, moreover, in this connection, is the fact that not a few of the speeches, especially in the earliest periods, were *written* and never delivered at all—and indeed would hardly be called orations even in 18th-century America!

The most disappointing features of the book are the notes and comments on the speeches. The biographical notes are meagre and stereotyped. Even college underclassmen in studying the speeches, notice the obvious attempt of the editor to over-praise the speakers. No one could miss the frequency with which the orators are described as "neat," "of good appearance," "had a fine head," "an eloquent speaker," "clear to the point." As a result, one unfamiliar with this field would find it difficult to distinguish the really excellent orators from the rest.

Even more disconcerting is the scantiness of the explanations of the circumstances under which the speeches were given. The time and place are frequently lacking and the textual source is almost never given. The latter fact, together with some internal evidence, arouses considerable doubt as to the absolute accuracy of the speeches.

As to the orations, no one could fail to be impressed by a faithful reading of them. One is, in fact, inclined to agree with the claim advanced by the editor that "these Negro orators have furnished the only humanizing theme which has stimulated eloquence during the last generation." Grammar may halt and bombast abound, and the cold light of reason be often obscured by the flames of passion, but one feels criticism to be out of place. Surely these speakers were well motivated. They had a message; they could not fail to be eloquent. One man says "I feel at liberty to speak on this subject. I have on my back the marks of the lash; I have four sisters and one brother now under the galling chain. I feel it my duty to cry aloud and spare not."

Aside from the more familiar speeches, such as those by Douglass, Remond and Washington, two are particularly noteworthy. One is a eulogy of William Lloyd Garrison by Bishop Reverdy C. Ransom, as well constructed, as impressive and as fitting a tribute as could be found. The other is an oration entitled "The Shame of America" by Archibald H. Grimké, bitterly radical, ruthlessly denunciatory, bitingly sarcastic—truly an astounding revelation of what the modern, thinking Negro is saying and hearing.

Teachers of public speaking and all who are interested in oratory or the American Negro may find in this unique collection, endless material and many hours of engrossing profitable reading.

RUSSELL H. WAGNER, *Cornell University*

A Dictionary of Modern English Usage. By H. W. FOWLER. Oxford. The Clarendon Press. 1926. Pp. viii + 742.

This interesting book, by one of the authors of *The King's English* and *The Concise Oxford Dictionary,* is dedicated to the memory of the other—the younger brother, F. G. Fowler, who died in 1918 of tuberculosis contracted in the B. E. F.

The text includes a lengthy series of short articles on specific words or phrases, and a lesser number of longer articles discussing general questions of usage. The specific articles cover such points as spelling, pronunciation, precise meaning, degree of synonymity, choice of variant forms, degree of obsolescence, reputability, connotation, social or dialectal limitation of usage. The general articles cover such topics as false emphasis, analogy, ellipsis, hackneyed

phrases, differentiation of noun and verb accent, Maloprops, use of italics, recessive accent, tautology, Saxonism and Anti-Saxonism—to mention only a few out of several hundred.

Both long and short articles are written in a breezy, humorous style, and although the pages look like those of any ordinary dictionary they prove to be most fascinating and readable. There is a wealth of real information, much of it not available elsewhere; there is wisdom and ingenuity in the explanations offered of linguistic phenomena, there is penetrating criticism, and every now and then there is a striking metaphor more suggestive of *belles lettres* than of lexicography. Every teacher of written or spoken English ought to own a copy, quote from it freely, and—for the better preservation of his own reputation for scholarship—conceal it from his students.

From the standpoint of the American teacher of speech, the work has, perhaps, two limitations.

In the first place, like the *Concise Oxford* and unlike the real *Oxford* (or *New English Dictionary*), it is intensely and narrowly English, giving no consideration at all to American usage and very little to that of the British Empire outside of southern England. For example it dismisses the words "autocar" and "automobile" with the naïve remark: "Now that *motor(-car)* has fully established its supremacy, it would be well if these rivals could be cleared away"—ignoring the prevailing usage in that English-speaking country which makes and owns more automobiles than all the rest of the world combined. Fortunately, however, this attitude shows itself in connection with a very trifling number of words, and at least nine-tenths of the comments are as sound in the United States as in England.

In the second place the book is based too exclusively on the written language and the written history of the language to earn the full confidence of a teacher of speech. The author has spent years of his life in dictionary-making, and while he is doubtless well trained in philology and phonetics as they are studied on paper he thinks chiefly in terms of the printed page and not of speech sounds. In his explanations of language changes and preferences, therefore, he fails to give proper consideration to euphony, to the influence of difficult sound combinations, of sentence rhythm, and of dialectal accent, and in general to the importance of ear

habits in shaping usage. To mention only a single example, in the discussion of *toward* and *towards* he says: "The -s form is the prevailing one, and the other tends to become literary on the one hand and provincial on the other." This is true, but a teacher of speech would have said that while the -s form has the sanction of tradition it is, in most sentences, the clumsier and more difficult to pronounce, and is therefore being abandoned by the masses who will not be bothered with clumsy sounds and by literary men who are sensitive to euphony. Mr. Fowler is almost invariably right in his observations of fact, but he misses many explanations which depend upon the ear.

To set against these two characteristics, however, the author has another which will please most of his American readers: He is not pedantic or puristic, and he goes after the affectations of the ultra-literary people in the spirit of a crusader. In his preference for Saxon over Latin words, and for well established English words over foreign borrowings he is almost fanatical; he has no patience with fine writing or with any sort of straining for effect. In other respects he is tolerant. His vision is broad and his understanding profound, and it is a past master of the language indeed who can find nothing to learn from him.

JOHN DOLMAN, JR., *University of Pennsylvania*

Standard English Pronunciation. By T. NICKLIN, The World's Manuals Series, Oxford, 1925, Pp. 101.

This volume includes a brief historical survey of the language, a section devoted to pronunciation and spelling, others to vowels and consonants, accidence and syntax, and miscellaneous observations. It must be obvious that a book of such scope is badly needed, since most of the existing works on the spoken language confine themselves either to historical development or descriptive phonetics, and rarely consider syntax at all. Jespersen's *A Modern English Grammar*, in dealing with all three aspects, is an outstanding exception, and Palmer's *A Grammar of Spoken English*, though it makes no attempt at historical treatment, is perhaps the most usable work on sound and syntax for anyone seeking a working facility in standard English.

The attempt to make so broad a survey in such limited space, even in the popular style contemplated by the editors of the

series, necessarily results in superficial, anecdotal treatment better suited to the entertainment of the casually curious than to the enlightenment of the student. Lack of space, however, does not wholly account for the confusion of subject matter, especially in the discussion of phonetics, in which the jumble of International symbols, the Websterian diacritics, and the author's improvisations on the conventional alphabet is very disconcerting and misleading, while such important factors as intonation and length of vowels are entirely ignored. The unsatisfactory treatment of phonetics seems to arise largely from a conception of spelling, rather than sound, as the basis of the real language. Were the book of practical help, these questions of theory might be glossed over, but since it presents no clear picture of the standard, and no method for moulding one's own speech under the influence of the standard, its reason for existence seems very slight indeed.

C. K. THOMAS, *Cornell University*

The Standard of American Speech and Other Papers. By FRED NEWTON SCOTT. Boston, Allyn and Bacon, 1926, Pp. 345.

These varied papers which Professor Scott has published at intervals since 1904 are distinguished by scholarship, urbanity, and humor. "The Congress of Letters" is such brilliant fun that one could wish Mr. Scott had not chosen to become a professor. In "The Standard of American Speech" Professor Scott denies the right of any locality to be the arbiter of correct speech; he insists that the standards of any section may be set by the educated persons living in it. "Finally, American speech is not a degraded or plebeian form of British speech—it is a vigorous, hardy offshoot that is gradually assuming a form appropriate to our character and daily needs." "The Genesis of Speech" presents the hypothesis that speech in its inception is significantly modified breathing, and traces the possible stages by which a life-serving and indispensable process has been transformed into the expressive and communicative function which is termed speech. To the oft-discussed question of the differentia between poetry and prose Professor Scott contributes his now well-known formula that prose is expression for communication's sake, and poetry is communication for expression's sake. This essay has many implications of importance to teachers of speaking and reading. "Two Ideals of Composi-

tion'' places Aristotle among the sophists and ascribes the failure of much teaching of composition to the fact that teachers have followed Aristotle's *Rhetoric* rather than the lofty conception of Plato. Charles Sears Baldwin (see his *Ancient Rhetoric and Poetic*) would disagree with Professor Scott in his interpretation of Aristotle. He insists that the Aristotelian rhetoric is the art of giving effectiveness to truth, while the sophistic rhetoric is an art of giving effectiveness to the speaker. Other writers have not felt so sure about the value of Plato's ''lofty conception'' as a guide to the art of composition—but the whole question of ''sophistry'' is a troubled one. The reviewer's copy of the volume suffers from careless binding; pages 235-250 appear twice, and pages 250-267 are missing.

EVERETT L. HUNT, *Swarthmore College*

Roman Education from Cicero to Quintilian. By AUBREY GWYNN. Oxford University Press, 1926, pp. 252.

A study of Roman education is to a considerable extent a study in the history of rhetoric. Greece captive captured Rome through its rhetoricians. Aubrey Gwynn has in this volume developed a study begun ten years ago in the University of Ireland. Continuing his research for two years at Oxford, he has produced an interesting work of sound scholarship. His contrast of Greek and Roman educational ideals is an admirable statement, and his development of the new Graeco-Roman culture is full of discriminating distinctions. The exposition of Cicero's *de Oratore* clears up a number of prevalent misconceptions, and shows a sympathetic understanding of Cicero. Quintilian's protest against the decadent rhetoric of the century after Cicero's death gains a new significance in Mr. Gwynn's treatment of the *Institutio oratoria*. The bibliography and the index add to the usefulness of the volume.

EVERETT L. HUNT, *Swarthmore College*

Plato's American Republic. By DOUGLAS WOODRUFF. New York, Dutton, Today and Tomorrow series, 1926, pp. 122.

Mr. Woodruff dedicates this satirical sketch of America to his colleagues of the Oxford debating team who journeyed with him into a far country. The author knows his Jowett, and has in many

other ways profited by his nurture in the home of sweetness and light. The diologues owe something to the questions debated in America, although the audiences and the American debaters with their statistics seem to have been more absorbing; Sinclair Lewis had evidently prepared the Oxonians to become American observers; a fertile imagination and lively wit will account for the rest. Should it be confessed with sadness that American debaters do not write such books? Possibly those who can write do not debate. Debating in America has followed the old Roman ideals of citizenship; whether it can be made literary without a Graeco-Roman decadence remains to be seen. Mr. Woodruff has had no experience to shake his faith in philosopher-kings, and America is not his ideal of a university community. Government, public opinion, education,—none of these were ever worse in Plato's Athens. But we would not give hemlock to a critic who is so amusing.

EVERETT L. HUNT, *Swarthmore College*

IN THE PERIODICALS

THE HIGH SCHOOL DEBATER is published quarterly by the students of Rutgers University in the interests of the Rutgers Interscholastic Debating Association. One hundred and fifty-five high schools are enrolled.

THE UNIVERSITY OF MICHIGAN BULLETIN for July 3, 1926 is devoted to the work of the Michigan High School Debating League. The work of the League is under the supervision of Mr. G. E. Densmore of the Department of Public Speaking. The Bulletin contains an account of last year's work, plans for this year, a few pages of advice to debaters and a bibliography on government ownership of coal mines, which is to be the debate question for the year.

O'NEILL, JAMES MILTON. *How to Judge a Debate.* Bulletin of the University of Wisconsin, Department of Debating and Public Discussion, 1925, pp. 21.

This pamphlet discusses the different points of view from which a debate may be judged, and declares the critic's vote to be better than that of the legislator or juryman in contest debates. The practice of accepting fees for judging debates is defended, a criticism blank is offered as a judge's score card, and a brief bibliography is appended.

E. L. H.

BRIGANCE, W. N. *In the Workshop of Great Speakers.* American Speech, I, II: p. 589, August 1926.

The habits of prominent persons in preparing to address the public—Roosevelt, Beveridge, Fosdick, Wilson, and Bryan, among others. The account of Bryan's fluency recalls the comment of an English reviewer: some speakers' minds are like poorly attended

churches, the small congregation can pass out quickly and in order; but fluency to a philosophical mind is as difficult as the egress from an over-crowded cathedral.

E. L. H.

FARMA, WILLIAM J. *Speech Training in Progressive Education.* American Speech, I, 9; p. 484, June 1926.

Mr. Farma insists that speech training is not elocution, that it is scientific, that it forces the student to coördinate what he has learned in his courses, that it enhances the expressive personality, and in general makes a vital contribution to progressive education. Any scepticism among educators, Mr. Farma feels, is due to prejudices they have carried over from the days of elocution.

E. L. H.

CRESPIGNY, CLAUDE DE. *American and English.* American Speech, I, 9; p. 490, June, 1926.

An amusing collection of differences in English and American colloquialisms.

E. L. H.

HERRICK, M. T. *The Early History of Aristotle's Rhetoric in England.* Iowa Philological Quarterly, Vol. V No. 3, July '26, pp. 242-258.

A carefully developed thesis to the effect that Aristotle's Rhetoric was probably not known to any extent in England until the 16th and 17th centuries. The first English publication of the Rhetoric (in Latin, however) was in 1619. Interesting, scholarly, valuable.

NISBET, R. H., *The Foundations of Probability,* Mind, Vol. XXXV, No. 136, pp. 1-27, January, 1926.

Those interested in the research problem of the application of the new logics will find valuable raw material in Mr. Nisbet's study. The opening pages, at least, are easily within the grasp of the layman and contain certain clear-cut and clarifying distinctions in relation to the important subject of probability.

G. M. G.

NEWS AND NOTES

DEPARTMENTS AND ACTIVITIES

[EDITOR'S NOTE: So much news material has been sent us in the course of the summer, especially in regard to dramatic and forensic activities, that it has become impossible to do more than summarize it. The Michigan High School Debating League alone has furnished enough material to fill our available space, and an adequate summary of the dramatic activities reported to us would require a special number.]

The Michigan High School Debating League, conducted as an extension division of the University of Michigan, is perhaps the most ambitious projects yet attempted in high school forensics. In the season of 1925-1926 about 200 schools participated, holding about 500 debates, in which 1000 students took part. It is estimated that 100,000 persons attended the debates. Particulars regarding the League and its activities will be found in the University of Michigan Extension Bulletin, New Series, Vol. XXVIII, No. 1.

Western Reserve University conducts an annual Extempore Speaking Contest for high schools. In 1925-1926 some 28 schools participated.

During the season of 1925-1926 Western Reserve University conducted 37 open forum debates at various clubs and community centers in and about Cleveland. Nine of these were intercollegiate debates.

At a meeting held at Brigham Young University on May 21 and 22, 1926, a new ROCKY MOUNTAIN SPEECH CONFERENCE was organized. Maud May Babcock, of the University of Utah was elected temporary chairman. It was voted to hold yearly meetings corresponding in time and place to those of the Oratorical league, with a President and Secretary chosen each year from the institution acting as host. H. P. Constans is President for 1927,

and E. W. Stevens Secretary, both of the University of Wyoming. The following program was carried out:

1. *Various Types of Debate Decisions*—E. W. Stevens, University of Wyoming.
2. *Oral Reading—Methods of Teaching Beginners*—Mrs. Ellen Clark Henderson, Provo Public Schools.
3. *Western Pronunciation and What Can be Done to Standardize It*—James L. Barker, University of Utah.
4. *The Place of Oratory in a Public Speaking Department*—T. Earl Pardoe, Brigham Young University.
5. *What Students of Speech Can Do for the Community*—Prof. Westfelt, Colorado Agricultural College.
6. *Speech—A Leaven for High School English*—Irene Holton, Brigham Young University.
7. *Dramatics in High School*—Harry Nelson, University of Utah.

During the discussion of Mr. Barker's paper a motion was carried pledging the members to make every effort to (1st) insist upon students pronouncing the Italian "a" correctly in "half", "calf", "laugh", "aunt", and "wrath"; (2nd) to pronounce correctly the intermediate "a" in such words as "ask", "class", "grass" etc.; (3rd) not to chew the final "r"; (4th) to stand for clean cut pronunciation of the unaccented syllables.

Probably the largest strictly forensic gathering ever held in the United States was the national convention of Pi Kappa Delta at Estes Park, Colorado, March 29 to April 1. Final registration figures showed a total of almost 400 delegates from more than 100 colleges. About forty colleges had representatives in the men's extempore and oratorical contests. The number of women participating was about half as large. The election of officers resulted in the choice of Alfred Westfall of Colorado Agricultural College as president; W. H. Veatch of the University of California, Southern Branch, first vice president; J. D. Menchhofer of St. Olaf College, Minnesota, second vice president; G. D. Finley of Colorado Teachers College, secretary-treasurer; E. R. Nichols of the University of Redlands, historian. All of these officers were re-elected, with the exception of Professor Menchhofer, who was chosen for the first time. At the banquet which closed the convention Mr. Stanley B. Houck, national president of Delta Sigma Rho, was the main speaker.

Under the auspices of Albion College and Western State Normal, at the regional meeting of the Michigan State Teachers Association held in Kalamazoo November 1-2, a special section was devoted to Debate and Dramatics. The following program was presented:

Coaching the High School Play—Laura Shaw, director of dramatics at Western State Normal.

What Constitutes Good Debating?—H. L. Ewbank, Albion College.

Some Needed Reforms in Contest Judging—Lenore Jacobs, Sturgis High School.

Round table discussion followed each talk.

The Pacific Forensic League held its Third Annual Conference at Washington State College, Pullman, Washington, April 8th, 9th, and 10th, 1926. The membership of the League includes the University of Southern California, Stanford University, the Oregon State Agricultural College, the University of Oregon, Willamette University, Washington State College, and Whitman College. Except that the officers of the League must be faculty representatives, faculty and student representatives have an equal voice in the councils of the League, each League member being represented by one faculty and one student delegate in the Conference of the League The activities of the League include debating, extempore speaking, and oratory, with separate contests in each of the three fields. The officers for the year 1926-27 are: Earl W. Wells, department of public speaking, Oregon State Agricultural College, President; William R. Davis, department of English, Whitman College, Vice-President; and Alan Nichols, coach of debate, University of Southern California, Secretary-Treasurer.

The following current debate questions have been reported to us:

1. Resolved, That the U. S. should own the coal mines.
2. Resolved, That the essential features of the McNary Haugen bill should be enacted into law.
3. Resolved, That the Constitution should be so amended as to give Congress power to regulate child labor.
4. Resolved, That this audience condemns the present tendency to extend governmental restriction of individual liberty.
5. Resolved, That the states should ratify the pending child labor amendment to the Constitution.

6. What is wrong with the American College? (For open discussion.)

7. Resolved, That foreign nations should relinquish all governmental control in China, except that usually exercised by consulates and legations. (Official question of the Pacific Forensic League.)

8. Resolved, That a National Board of Censorship should be established by Congress to control the release and exhibition of all moving pictures. (Second choice question of the Pacific Forensic League).

9. Resolved, That the exercise of the suffrage should be made compulsory.

10. Resolved, That compulsory liability insurance for motorists would tend to decrease accidents.

The Cornell Dramatic Club dedicated the new University Theatre in Willard Straight Hall on November 19th, 1925, with a revival of *The Contrast*, by Royall Tyler. The new theatre has a remarkably well-equipped and adaptable stage, suitable for almost any style of production. *The Contrast* was presented with a flavor of the eighteenth century manner, and the performance was given favorable notice in several of the dramatic and theatrical papers.

The Minnesota Masquers of the University of Minnesota varied their season's program last year by holding an Exhibition of Stage Design. The exhibits included a number of famous designs loaned by the Theatre Arts Monthly, together with many original designs by members of the club and others.

NORMAL SCHOOL NEWS

(Edited by CARROLL P. LAHMAN, Western State Normal School, Kalamazoo, Michigan)

The Department of Speech, Western State Normal School, Kalamazoo, Michigan, is offering three new courses during the spring term: two-hour courses for upperclassmen in Practical Public Speaking and Parliamentary Usage, and a course without credit in Speech Correction. The corrective work is handled on an individual basis. It is planned in the future to offer work for teachers in the correction of children's speech defects.

In the semi-final men's contest of the national debating tournament at the Pi Kappa Delta convention at Estes Park, Colorado,

April 1, Emporia Teachers of Kansas met Northern Teachers of Aberdeen, South Dakota. In the final debate the College of Emporia defeated Northern Teachers.

Laura Shaw and Anna Lindblom of Western State Normal of Michigan attended the Summer School of Speech of the University of London. The first two-weeks session on speech training was held at Oxford University; the second two weeks were given to a study of the drama at Stratford-on-Avon.

Lester W. Boardman of Colorado Teachers College, who this year has been exchange professor at Goldsmith College, University of London, will return in the fall to resume his position as head of the English department and coach of debate and oratory.

During Mr. Boardman's absence his place has been taken by Harold Randall, formerly of Westminster College, Salt Lake City.

N. S. James and G. W. Campbell, of the department of English, are in charge of Speech work at the normal school at Oshkosh, Wisconsin. During the first semester of the present year Mr. Campbell was on leave of absence for graduate work, returning at the opening of the second semester. During the second half-year Mr. James has been on leave of absence.

Mary Vandenbark of Depauw University has joined the Department of Speech at Western State Normal School, Kalamazoo, Michigan.

Margaret Constance is on leave from Mankato State Teachers College, Minnesota, to secure her master's degree at the University of Wisconsin. Her place is being filled by Mary Cryan, M. A. Wisconsin 1926.

Helene Wilson, last year at the State Industrial College for Women, Denton, Texas, has gone to the normal school at Oshkosh, Wisconsin.

PERSONALS

Lousene Rousseau, former secretary of the NATIONAL ASSOCIATION and associate editor of the QUARTERLY JOURNAL has returned from a year abroad and is now teaching at the University of Wisconsin.

V. E. Simrell, A. B., Cornell, 1924, has been apppointed a member of the faculty of Kalamazoo College, Michigan. He will have charge of public speaking and debate.

J. Fred McGrew, formerly on the staff of the Department of Speech at the University of Wisconsin, is now in charge of public speaking and dramatics at the University of Arkansas.

Lucille Welty, A. B. University of Michigan has accepted a position at Lawrence College, Appleton, Wisconsin.

Jeannette Bjorneby is the newly appointed director of dramatics at the University of South Dakota.

N. J. Weiss, for the past four years instructor in Speech and coach of debate at Central High School, Kalamazoo, Michigan, has accepted a position as member of the Department of Speech at Depauw University, Greencastle, Indiana. He will assume his new duties in the fall, when he will have charge of all contest work, both debate and oratory.

Carl Robinson of the University of Illinois has taken the place of N. J. Weiss as instructor in public speaking and coach of debate at Kalamazoo Central High School.

W. P. Sandford, formerly of Ohio State University, has been appointed Assistant Professor of English, in charge of courses in Public Speaking, at the University of Illinois. Marvin T. Herrick, formerly at Iowa State College, has also been appointed as Assistant Professor and will give courses in Play Production and Interpretation. Other additions to the staff at Illinois are V. L. Baker, a graduate of Muskingum College, and Mary E. Whiteford, a graduate of Ohio State University.

Russell H. Wagner, who has for the past year been acting head of the Public Speaking Department of Iowa State College, is spending a year's leave of absence in study and teaching at Cornell University.

Newell C. Maynard, of Tufts College, had charge of the courses in Public Speaking at Harvard University during the summer session, conducting two courses: one in The Fundamentals of Speech Training, and the other in Advanced Public Speaking. Mr. Maynard has also been invited to teach the courses in Public Speaking at Harvard during the academic year.

Lionel Crocker, University of Michigan, will have charge of the courses in Public Speaking on the world cruise of the floating university sailing from New York September 18. His wife, Dr. Geraldine Hamilton Crocker, will serve on the cruise as women's physician.

William Hawley Davis, formerly of Bowdoin College, is now Professor of English and Editor of the Stanford University Press at Stanford.

Frederick B. Robinson, author of *Effective Public Speaking*, and one of the pioneer members of the Eastern Public Speaking Conference, is acting President of the College of the City of New York, in the absence of President Mezes.

Daniel W. Redmond, past President of the Eastern Conference and well known in the NATIONAL ASSOCIATION, has been made Dean of the College of Liberal Arts and full Professor of Public Speaking in the College of the City of New York.

J. K. Horner, formerly of the University of Oklahoma, is now coach of debate at the University of Oregon.

Everett Lee Hunt, formerly of Cornell University, has accepted a permanent position at Swarthmore College.